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SIR RABINDRANATH TAGORE'S VIEWS ON SOME EDUCATIONAL QUESTIONS.

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THE object of this paper is not to present a reasoned review or a connected statement of any of the opinions of the great Indian Poet, Mystic, Scholar and Educationist, Sir Rabindranath Tagore. Such an attempt must be reserved for abler hands and at any rate for some other occasion. And even if an attempt were made, the essay cannot be compressed within the limits of a magazine article. Further, of his own system and principles of Education, he has himself given the best exposition in his *public* lectures and writings, in his own inimitable style of a genius of letters. Nothing more is, therefore, aimed at, here, than to place before the reader, in the form of notes, some of Sir Rabindranath's views, as they were jotted down at the *private* conversations at which the writer was allowed the privilege of being present, during the poet's stay at Bangalore and Mysore, in January last.

I. UNIVERSITIES.

(1) *Professors*:—While for the routine work of the University classes, men may be appointed, as Assistant Professors, in consideration of their academical titles and diplomas, it would be a most serious blunder to select professors for higher work on the same principle. For, the latter have to be the leaders and directors of thought. And none but such as have given unquestionable proof of originality and genius should be placed in such positions. It is because of this defect in our Universities that most of them have not been the success that they should otherwise have been.

a. The right method of appointing Professors is to invite the leading writers and thinkers available, on any subject, irrespective of race, colour, creed or caste, to deliver courses of lectures and to select the best from among such lecturers.

b. Next, such Professors, when appointed, should be bound by a condition that within *three* years they should produce some original work and that in every three years succeeding, they should continue to give evidence of thought on original lines.

c. The system of 'Exchanging' Professors of different Universities for short periods, as in America, should also be adopted.

High salaries must necessarily be paid. But that will be cheaper than the present system, which is more costly, in that it does not bring a corresponding return for the large sums spent.

(2) *Selection of Men for Specialization*:—Now-a-days men are being deputed for special study not only within the University but also to places outside. But the results such men have thus far achieved, though in some cases really brilliant, yet in most cases have not been equal to the expectation. And that is because the selection is not rightly made. Mere academic titles are not

a safe guide. Nor is the selection made by authorities competent to judge of the merits of such candidates. It is only when young men have been in close touch with Professors with originality of thought, that their merits and aptitudes for *original* work can be known. And this can be judged best not by ordinary lecturers, usually known as Professors; but by those who have done original or research work.

a. There should be travelling scholarships to enable the students to visit different provinces in India collecting materials for their special studies from direct observation and submitting them to proper authorities.

b. Professors, engaged in research work, should select students to collaborate with them. The mechanical portions of their work, such as collecting data from different sources, collating different versions of texts, drawing up concordances, and other such tasks, should be left to these students to carry out with the guidance of their professors.

(3) *Subjects of Study*:—Another chief reason for the paucity of original thought and production in the existing Universities, is the viciousness of dividing the pupils' energies and attention in the Collegiate stage. A grounding in general knowledge ought to be provided for up to the Entrance. But in the University, pupils should be allowed to bring up, for a degree, only *one* subject, in which the standard might be raised. Such a graduate will have greater depth, consequently greater love of his subject, greater aptitude for research work and better scope for manifesting originality, if he have any.

The Universities will then turn out a superior type of graduates, which alone could make for real advancement of knowledge in the land.

(4) *The Medium of Instruction in the University*:—As a general rule the mother-tongue, *if it be one of the leading* vernaculars of India, should be made the medium of instruction. But the adoption of this principle should be *gradual*. The sciences cannot be immediately taught in the vernacular. It is, therefore, necessary to *bifurcate* the courses of study in the University. Pupils desirous of bringing up humanistic subjects like History, Economics, Sociology and Philosophy, should be made to get their education in the vernacular. Pupils seeking to gain degrees in Science subjects should be instructed through the medium of English. The necessary books for the humanistic subjects may be translated *at once*. In the course of ten or fifteen years, all the courses may be given in the vernacular and the 'bifurcation' abolished. English should be universally taught as a second, but '*Compulsory*' language.

(5) *Fine Arts*:—Instruction in Fine Arts is an urgent necessity. For, these arts develop a province of the mind, which remains untouched by modern Indian education. This defective development of the mindof our times has seriously stunted the growth of national life.

The first step must be to organize, under the direction of experts, a 'Museum' on the most scientific lines. Articles indicative of the life and culture of all the peoples of India, must be secured and then similar articles of other races and cultures of the world, as far as possible. They must be classified according to the purposes they were or are intended to serve, so that the underlying ideas may be studied not only from economic, historical or ethnological standpoints, but also from the ethical and æsthetical.

(6) *Sanskrit Education*:—There is a false notion that Buddhistic culture is either antagonistic or alien to Hindu culture. But they are, in fact, more closely related than Aryan and Dravidian cultures. The study of the Buddhistic and the Pali literature should be combined with a study of Sanskrit literature. The Pehlavi literature should also be

associated with it, for the same reason. Else, a comprehensive idea of Sanskrit *culture* cannot be attained.

II. Women's Education.

Women's Education cannot be the same as men's for the reason that women have a special duty to discharge towards society and humanity. It is not that every woman should be made to learn the culinary art or that she should have no higher ambition than to be a cook or a house-manager. Woman has a right to learn the sciences and arts that man learns, and to enter, *as far as practicable*, the walks of life that man usually seeks. But it must not be forgotten that to her alone belongs one of the greatest privileges of life. Of Nature's endowments to man the most valuable is his 'individuality.' Its preservation and development is one of humanity's foremost concerns. This work can be done best only by woman. She must, therefore, be first trained for discharging this great duty of rearing up the real man of the future. And her studies must be subordinated to this end. Else, the very object of creation will have failed. The courses that have such an aim can be best given in the *Vernacular*.

III. Primary and Secondary Education.

So far as the Primary stage goes there is something to be said in favour of the old Hindu method of teaching pupils one subject after another. It does not mean that the child should learn nothing of history or geography for months or years when it is engaged in the study of Language or Arithmetic. When Language is taken up, it should be the one subject of special and direct instruction. But the teacher and the parents may give the child talks on various topics or subjects *incidentally* in the garden, on the road, at dinner or elsewhere. Task work must be confined only to one subject. The talks should prepare the child for receiving instruction in other subjects, later on. In the High School or Lower Secondary stage, however, a number of subjects may be taught simultaneously.

The mother-tongue should be the medium of instruction. The fewer the text-books the better in the Primary and the Lower Secondary stage. In the High School stage vernacular text-books for all subjects should be prepared, without any further delay.

IV. Education in General.

All educational development must proceed from within outwards. It is really a spiritual process, not merely an intellectual or a mechanical one. The spirit being greater than the body and even the individual mind, education is a process covering the widest area. Education is, in a real sense, the breaking of the shackles of individual narrowness. The aim must, therefore, be to develop not only the *individual* aspect of the mind but also the *universal* or the *spiritual*, which is the chief characteristic of the ancient Hindu system. It is therefore necessary to bring *together* in every educational organization, *all* the different cultures found in India and, as far as possible, all the cultures of the world, all the phases of religion and art, in which the universal mind has expressed itself in different ages and countries, *i.e.*, to co-ordinate these various cultures without attempting the suppression of the natural differences. The highest aim of education should be to help the realization of unity, but not of uniformity. Uniformity is unnatural. And in fact, its attainment is impossible. A sound educational system should provide for the development of variety without losing the hold on the basic or spiritual unity.

Hence the idea underlying the Bolepur school is to bring together pupils of all creeds and cultures and to help them to realize their spiritual brotherhood and to develop, freely and fully at the same time, their individual and racial characteristics.

V. A Real Indian University.

There must be a place, if not in every province, at least in one centre in this vast country, to which the best intellects of India and even of the world outside, could be induced to resort, where they could meet, stay temporarily or permanently and impart their knowledge to the public. It will help to kill racial, sectarian, caste and other prejudices and be a real fountain of universal light. It is only Hindu States, whose rulers have in their veins flowing the ancient Aryan spiritual culture, based on 'unity' and 'universality' can realize its importance and organize a real university of this type, which will be India's educational contribution to the world's progress.

NOTE ON THE POSSIBILITIES OF INCREASING AGRICULTURAL PRODUCTION IN MYSORE.

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THE question of the increase of agricultural production in the State is a large and many-sided one and in the following note I do not propose to touch upon any but the more important points connected with it. The actual value of the agricultural products of Mysore does not depend alone upon the quantity produced. The prices obtaining form an important factor and, at the same time, one over which we have practically no control. There are few agricultural commodities in the production of which Mysore plays such a predominant role as to be able to govern or even to influence greatly the market rate. It is, therefore, impossible to predict whether the value of the agricultural produce of the State during the next ten years is likely to be greatly affected by the factor of prices. We may, however, safely assume, in any forecast of production which can be made at present, that the average prices of agricultural commodities for the next ten years will not be less than they have been in the past ten years while the probability is that they will be much greater.

Leaving out of the question the possibility of our agricultural production being increased in value by a rise of prices, there are, in the main, three directions in which increased production can take place. In the first place, the total area under cultivation may be increased. In the second place, less valuable crops may be replaced by more valuable ones, and in the third place the production of crops per unit area may be increased. The probability is that progress will take place in all three directions at the same time and this makes the forecasting of the extent of progress possible within a definite period, a very difficult and complicated question for, it is impossible to consider any one of these lines of development as entirely independent of the other two.

In estimating the possibilities of increase of production we must have something definite to start from in the shape of figures showing our present production. The Agricultural Committee have recently issued estimates for three years, *viz.*, 1913-14, 1914-15 and 1915-16. An examination of these figures is out of place here but it is sufficient to note that, while the total values given for the agricultural produce in the State do not vary greatly in the estimates for the three years the values of individual crops do so to a very marked degree. Whether the values given are approximately correct or not, it would, therefore, not be sound to use as a basis the figures of any one of these years. The soundest basis is undoubtedly the average production calculated on the results of a series of years. How long this series should be, we do not know, but we are, I think, safe in presuming that a ten year period is not too long. I propose therefore to take as a basis, averages for the decennium 1905-06 to 1914-15. Practically the only figures available for these ten years are those compiled by the Revenue Department and published in the Season and Crop Reports. There is a general consensus of opinion that the figures given in these Annual Reports are fairly accurate as regards the total area under cultivation and the area under individual crops. When we come to the estimates of production of these crops there is a strong belief that the figures are likely to be too low. Failing any means of checking the accuracy of these figures, however, there seems no course open but to accept them.

In the accompanying tables are given certain statistics with regard to agriculture during the decennium 1905 to 1915 which it is necessary for us to study carefully if

we are to make an intelligent forecast of the improvement in production possible in the next decennium.

Table I contains figures with regard to areas of cultivable and cultivated land. The figures given in column 2 of the table do not embrace all the cultivable land in the State as they do not include areas under occupation as Jahgirs, Inam villages, etc., and lands in Date Reserves and Amrut Mahal Kavals. While these areas are important, information is not forthcoming to enable us to estimate what amount the sofe various areas are at present available for cultivation or may be made so within the next decennium. As would be expected the figures in this column do not vary from year to year to any great extent. The figures given in column 5 and showing the area of culturable waste land which is unoccupied are very interesting. We find a steady and almost regular reduction in the amount of cultivable land available for occupation in the State.

TABLE I.

Years	Total culturable area	Total area under occupation	Net area cropped	Culturable waste	Current fallows	Total culturable land which remained uncultivated	Percentage of occupied land which was uncultivated	Percentage of culturable land which was uncultivated
1	2	3	4	5	6	7	8	9
1905-06 ...	8,648,835	7,257,493	5,799,850	1,391,342	1,477,643	2,868,985	20·3	33·1
1906-07 ...	8,606,883	7,271,169	6,030,486	1,335,716	1,240,683	2,516,399	18·4	29·9
1907-08 ...	8,638,394	7,332,139	6,011,671	1,305,455	13,21,268	2,626,723	18·0	30·4
1908-09 ...	8,584,443	7,379,703	5,762,602	1,232,483	1,611,242	2,821,841	21·8	32·0
1909-10 ...	8,570,916	7,444,176	6,092,153	1,126,498	1,352,266	2,478,764	18·1	28·9
1910-11 ...	8,563,367	7,500,638	6,188,113	1,062,728	1,312,525	2,375,254	17·5	27·7
1911-12 ...	8,565,085	7,545,521	6,047,455	1,019,563	1,494,988	2,517,630	19·8	29·5
1912-13 ...	8,558,260	7,601,650	6,319,019	966,610	1,272,631	2,239,241	16·7	26·1
1913-14 ...	8,574,064	7,636,858	6,056,463	937,206	1,580,395	2,517,601	20·7	29·3
1914-15 ...	8,561,624	7,671,449	6,244,302	890,175	1,427,147	2,317,322	18·6	27
Average for ten years.	8,587,187	7,464,159	6,055,221	1,126,778	1,405,079	2,533,976	18·8	29·5

An examination of figures for previous decennia shows us that the taking up of land for cultivation has been going on for the past three decades, the figures for the different decades being as follows :—

TABLE II.

Decade	Decrease in unoccupied arable land	Average decrease per year	Increase in area under occupancy	Average increase per year	Average area under cultivation	Increase
1885-1895	10,25,039	1,02,503	1,447,009	1,44,700	46,27,144	...
1895-1905	2,74,298	27,429	3,96,341	39,634	59,43,885	13,16,741
1905-1915	5,01,167	50,116	4,13,956	41,395	60,55,211	1,11,326

The figures given in Table II show that there has been a steady tendency leading to a reduction of our reserves of unoccupied arable land with an almost corresponding increase in the area under occupancy. This tendency was most marked in the decade 1885-1895 for reasons which must be obvious to all. It has, however, continued in an unmistakable manner during the subsequent decades. If we turn to the area under cultivation we find that there is a much greater irregularity, for seasonal conditions come into play here. While there is not a regular increase from year to year it becomes evident as soon as we take averages for the three decades from 1895-1915. The average area under cultivation during the decade 1895-1905 shows a very large increase over that for 1885-1895; on the other hand, the difference between the average area under cultivation during the period 1905-1915 and that for 1895-1905, while still existing, is much less prominent. It has, moreover, not kept pace with the area which has been taken up for cultivation. This indicates one of two things. Either the climatic conditions during the decade 1905-1915 have not been quite so favourable as those during the previous decade, resulting in a reduced percentage of the total occupied area kept under cultivation, or else the agriculturists of the State have been taking up unoccupied land more rapidly than their resources in labour or capital will enable them to cultivate it.

A comparison of the relation between the average area occupied and the average area cultivated during the three decades is not without interest.

Decade	Average area cultivated in per cent of total occupied area
1885—1895	75·8 per cent
1895—1905	84·2 ,,
1905—1915	81·2 ,,

These figures seem to me to indicate that the resources of the agriculturists have played at least some role in determining the percentage of the land occupied by them which they actually cultivate. During the decade 1885-1895, there was a rapid increase in the amount of land under occupation with which, it would appear, the resources of the agriculturists could not keep pace. During the decade 1895-1905 the rate of taking up unoccupied land showed a very marked fall; the resources of the agriculturists as a whole no doubt increased at the same time, with the result that a considerably greater percentage of the occupied land was cultivated. During the decade 1905-1915, the rate of taking up land increased somewhat and there was, at the same time, a small decrease in the percentage cultivated. There is, however, a certain percentage, which we may possibly take at 10 per cent of the total area occupied, which will, in any one year, be uncultivated because the seasonal conditions are not sufficiently favourable to warrant the growth of a crop.

The considerations are, I think, important because an increase of the area under occupancy is only advantageous if it is

accompanied by a corresponding increase in the area under cultivation, otherwise it is likely to lead to a decrease rather than to an increase of the agricultural wealth of the State. Our aim must be, therefore, to endeavour to ensure that land when taken up for cultivation is actually cultivated and not simply kept fallow by agriculturists who have neither the means nor the energy to utilize it to good advantage.

An examination of Table I shows that in reality the area under occupancy which is still uncultivated is considerably larger than the unoccupied area. Moreover as already pointed out the unoccupied area has shown a continuous and fairly rapid reduction during the past three decades, while the occupied area remaining uncultivated has not shown any such diminution. It appears doubtful therefore if any special inducements are required to stimulate the taking up of unoccupied land for cultivation as it seems impossible that much of the assessed waste land still available is in any way more suitable for cultivation than the large area under occupation which is yearly left idle. Such land is almost certain to be on the margin of cultivation and the agriculturists would, as a whole, be more profitably employed in reducing the large uncultivated area under occupancy rather than in adding to their holdings land of rather doubtful value. This does not, however, apply to the question of making lands available for cultivation which are at present in the possession of the Amrut Mahal Department or are inclnded in Date Reserves. Under these two heads there are undoubtedly fairly large areas of good land which would, if brought under cultivation, give much larger returns than they are now doing. If this question is tackled immediately we can, I think, look forward to an increase of land under cultivation amounting in all to 600,000 acres within the next ten years. If we take, at a very conservative estimate, that this land will bring in returns amounting to Rs. 10 an acre more than it does now this would represent an increase of agricultural production amounting to Rs. 60,00,000 per annum within the decade.*

To enable us to bring about this expansion in cultivation rapidly the introduction of labour-saving implements on a large scale is essential. It is also essential that we should not have to trust to foreign countries for the supplies of agricultural implements, such as ploughs, which are likely to be in such large demand as to enable us to manufacture them economically here. If, however, we are to have our implements made locally it is equally essential that products which will compare favourably with imported ones should be produced. The establishment of a well equipped plough factory, with a first class man in charge, is one of the first conditions for a rapid spread of the use of improved implements. The question of the introduction of improved implements and the possibilities in this regard will be discussed later on in this note.

The most important object that every agriculturist in Mysore has in view is to produce sufficient food stuffs to supply himself and his family. We have, as yet, practically no specialization in agriculture such as we find in certain western countries. In the United States, for example, the farmer is frequently satisfied to grow one or two crops, whether they be food or non-food crops, and to purchase the rest of his food necessities. It will probably be a very long time before such a condition of affairs obtains in India and, in fact, such a change is not to be desired. A certain diversification in agriculture is essential if the best results are to be achieved and the tendency at present in America is to a greater diversification rather than to a greater specialization of crops.

* The question of utilizing Gomal lands has not been considered. It seems to me unlikely that this subject will come into the sphere of practical action during the next ten years.

If we consider our chief food crop, ragi, which occupies about one-third of our total cultivated area and which supplies the staple food for about four-fifths of our population, there are several points which make it unique. In the first place Mysore is the only large section of India where this millet occupies a predominant position among dry crops. The fact that it furnishes the main article of food for only a comparatively small number of people outside the State and the additional fact that the profits from its growth are small, precludes the possibility of its becoming a commercial crop. It thus differs fundamentally from paddy which, although also a very important food crop for home consumption has, at the same time, such extended use in other parts of India and the world that it can always furnish an important source of income to the agriculturist.

TABLE III.

	Ragi production in pallas	Net export in pallas	Percentage of export to production
1913-14	42,69,000	2,91,000	7 per cent
1914-15	53,75,000	1,47,000	2·7 ,,
1915-16	62,96,000	2,19,000	3·5 ,,

Table III shows the total ragi production and the net ragi export for the three years 1913-14 to 1915-16, the only years for which export figures for ragi are available. These figures do not include export by road but this, in any case, will be small, so the figures are sufficiently accurate. The interesting fact is revealed that our export has ranged between 2·7 per cent and 7 per cent of our total production, an amount which is so small as to be almost negligible. As a matter of fact, the real percentage figures are probably smaller than those given in the table as the figures for production are, in all likelihood, low. This, together with the well known fact that there is comparatively little trade in ragi within the State, shows us pretty clearly two things. Firstly, there appears to be very little scope for developing an export trade in this crop and secondly, the raiyats, fully realizing the smaller profit from ragi cultivation, grow it almost exclusively for consumption in their own families.*

From these facts we may draw two conclusions. Firstly, unless and until the agricultural population becomes greatly increased there will be no great scope for an increase in area under ragi in the State; secondly, a marked increase in outturn per acre for ragi, an increase which, as will be seen later, there is every reason to hope we shall be able to obtain within the next ten years, is likely to lead automatically to a reduction in the area under that crop. We shall thus have the somewhat paradoxical state of affairs of the increase in production per acre of a certain crop leading to a reduction in area under this crop. A superficial view of the subject might lead to the question, "What real benefit will be derived by work on the improvement of this crop if, at the end, we find the total production practically stationary?" The answer is a fairly obvious one. Every increase in production of ragi per unit area will free some land for the production of money crops. The particular money crops which are likely to take the place of ragi over large areas of the State are oil seeds and one might single out for special reference among them ground-nuts.

* The abnormal conditions that have obtained during the past year have led to an unusual demand for ragi outside the State. The high prices resulting have brought ragi temporarily into the category of commercial crops. It is however extremely unlikely that it will remain there with a return to more normal conditions.

We have unfortunately no separate statistics of production for this important crop but the rail-borne trade statistics indicate that, in the three or four years immediately preceding the War, there was a remarkable increase of production of ground-nuts in the State (*vide* Table IV).

TABLE IV.

Exports and imports of Ground-nuts (figures in lakhs of rupees).

1904-05	1905-06	1906-07	1907-08	1908-09	1909-10	1910-11	1911-12	1912-13	1913-14
Net Imports	Net Imports	Net Imports	Net Imports	Net Imports	Net Imports	Net Exports	Net Exports	Net Exports	Net Exports
0·11	0·33	0·31	0·02	1·24	1·14	1·83	1·71	5·72	4·77

The money value per acre of ground-nut was, before the War, at least 50 per cent higher than that of ragi so that the freeing of a considerable area of land now used for growing ragi for the cultivation of this important crop would represent an increase by 50 per cent of the production on the area so freed. But this is not all. It is an established fact that the rotation of ground-nut with ragi has a markedly favourable effect on the ragi crop itself. Recent experiments on the Hebbal Farm indicate that a crop of ragi after ground-nut may be as much as 50 per cent greater than the ragi crop on similar land which had ragi on it the previous year. If, at the same time that the raiyats are persuaded to take more and more to ground-nut cultivation, they are taught to introduce a system of rotation we shall have produced a beneficial effect on the agriculture of the State which it is hard to estimate. The use of ground-nut oil in the development of manufactures in the State and of ground-nut cake as a source of enrichment to our impoverished soils and as a feeding stuff to our underfed cattle would open up further immense possibilities for the increase of our wealth.

I have taken ragi as an example of what may be done in the way of partially replacing a food crop by a more profitable commercial crop, provided we, at the same time ensure, that the total production of the food crop is increased rather diminished, by a greatly increased production over the smaller area. It would, of course, be foolish to ask the raiyat to restrict the area under food crops unless we were, at the same time, able to show him how to increase the production per unit area. The raiyat would not, in fact, be likely to listen to us for, after all, his first consideration must be to provide food for himself and his family. I have elaborated this important phase of the question of increase of production simply for the purpose of emphasizing the fact that the best way to increase production may be by restricting the area under some of what are at present our most important crops and I would suggest that in a future revision of our standard development forms, this should be taken into consideration.

We have discussed the possibilities of the increase of area under cultivation in the State and have further considered the general question of replacing crops by others which will bring in more money to the cultivator. There remains to consider the possibilities of improvement under individual important crops and other sources of agricultural wealth.

RAGI.

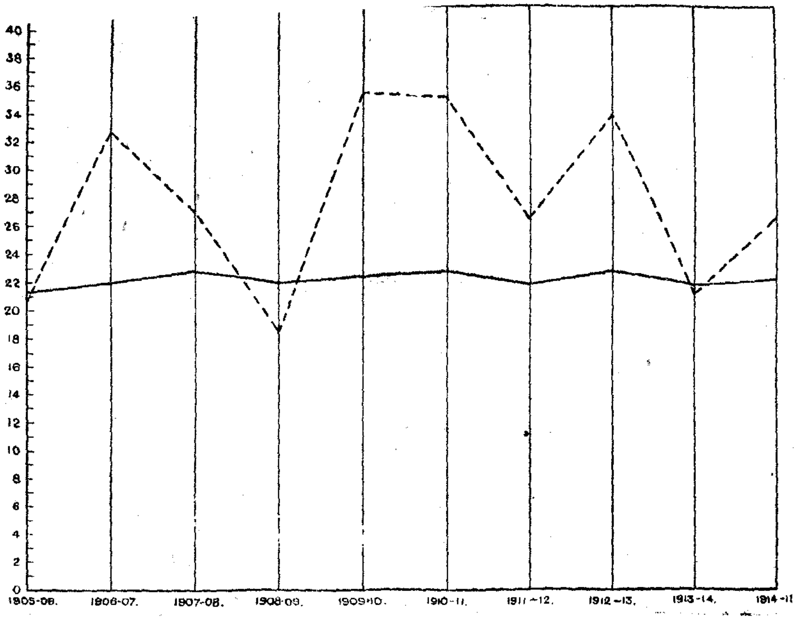
According to Table V, the average area under ragi in the State during the ten years 1905-1915 was 2,232,707 acres. This is rather more than one-third the total area

cropped in the State. From the standpoint of area, therefore, ragi is by far our most important crop. As will be seen from the table, there is a certain amount of fluctuation from year to year in the area under ragi but this is not so great as one would expect to find. If we examine the yearly figures we find that the variation from the mean area barely exceeds 5 per cent either way and does not amount to 10 per cent on the whole. If we compare the acreage in 1912-13, when the maximum for the decennium was reached, with 1905-06, which had the minimum area, the difference is only 181,499 acres or slightly over 8 per cent of the mean area. If these figures are correct it indicates a remarkable steadiness in the area under this food crop.

In the second and third columns of the table will be found figures showing the outturn and money value of ragi for the State during the decennium. These figures must be considered as roughly approximate only but they are the best that are available. They show a very great fluctuation both in outturn and money value. The year 1908-09 shows a yield slightly over 33 per cent below the mean,

TABLE V.

Year	Ragi			Paddy		
	Area cultivated	Outturn in pallas	Value in	Area cultivated	Outturn in pallas	Value in
1	2	3	4	5	6	7
			Rs.			Rs.
1905-06 ...	2,127,143	4,139,264	2,58,80,400	683,262	3,383,816	1,91,74,958
1906-07 ...	2,200,508	6,572,848	4,27,23,512	736,898	4,577,654	2,63,41,510
1907-08 ...	2,294,660	5,439,984	3,57,19,892	724,291	4,427,213	2,33,49,671
1908-09 ...	2,216,921	3,703,989	3,14,83,987	648,939	3,071,638	1,68,94,009
1909-10 ...	2,256,117	7,136,675	4,81,72,542	741,917	5,426,536	2,71,32,680
1910-11 ...	2,289,375	7,114,952	4,62,47,188	791,877	5,078,069	2,66,59,862
1911-12 ...	2,217,794	5,328,766	3,46,36,980	727,953	4,293,331	2,36,13,320
1912-13 ...	2,335,207	6,840,442	4,44,62,873	750,661	4,420,228	2,53,06,311
1913-14 ...	2,184,401	4,268,626	2,80,12,858	761,742	3,631,319	2,45,11,404
1914-15 ...	2,233,634	5,374,796	3,62,79,873	698,861	3,476,576	1,91,21,168
Average ...	2,235,586	5,592,034	3,42,51,148	726,640	4,178,639	2,32,10,479



Text figure I--Chart showing fluctuations in the area under and outturn of Ragi during the decennium 1905-1915.

Year	Jola			Horse Gram		
	Area cultivated	Outturn in pallas	Value in	Area cultivated	Outturn in pallas	Value in
	8	9	10	11	12	13
			Rs.			Rs.
1905-06	567,480	824,162	...	591,953	539,720	44,52,690
1906-07	575,060	1,062,629	...	608,473	655,624	45,89,368
1907-08	580,015	1,091,987	...	594,613	681,147	40,86,882
1908-09	640,610	787,158	...	545,502	314,997	18,89,982
1909-10	683,255	1,668,826	...	581,461	695,280	69,52,800
1910-11	619,004	1,381,506	...	672,458	852,304	59,66,128
1911-12	669,121	1,269,504	...	671,014	820,986	54,73,240
1912-13	610,888	1,121,726	...	688,728	396,822	27,77,754
1313-14	659,203	1,071,538	...	709,775	429,883	35,46,536
1914-15	598,820	903,929	...	730,085	557,097	44,56,776
Average ...	620,346	1,118,296	5,591,480	619,406	594,386	44,20,745

Year	Sugar-cane			Gingelly		Cotton		Coffee	
	Area cultivated	Outturn in maunds of jaggory	Value in	Area cultivated	Value in	Area cultivated	Value in	Area cultivated	Value in
	14	15	16	17	18	19	20	21	22
			Rs.		Rs.		Rs.		Rs.
1905-06 ...	39,427	2,925,296	44,79,359	92,595	...	74,920	...	107,240	...
1906-07 ...	40,373	3,354,870	41,93,585	94,548	...	77,489	...	108,354	...
1907-08 ...	44,550	3,462,725	60,59,768	100,608	...	84,001	...	104,370	...
1908-09 ...	33,253	2,185,289	47,80,319	81,545	...	58,953	...	104,086	...
1909-10 ...	34,969	3,359,553	65,10,134	114,672	...	81,484	...	102,659	...
1910-11 ...	40,509	3,775,697	75,51,394	104,137	...	101,591	...	104,652	...
1911-12 ...	44,343	3,396,629	62,57,533	98,512	...	107,876	...	107,058	...
1912-13 ...	41,556	3,423,119	55,62,568	122,091	...	151,901	...	105,875	...
1913-14 ...	41,011	2,903,543	48,99,728	114,043	...	99,289	...	107,462	...
1914-15 ...	34,213	2,404,615	75,64,518	73,395	...	110,398	...	122,508	...
Average...	39,420	3,119,134	58,97,113	99,615	29,88,450	94,790	2,073,532	107,425	7,500,000

that for 1909-10 slightly more than 27 per cent above the mean for the decennium. Thus we find in two succeeding years a total fluctuation of 60 per cent from the average for the ten years. The fluctuation which is clearly largely, if not entirely, due to differences in climatic conditions during the growing season is sufficient evidence of the impossibility of detecting, from a study of year to year results, the results of work done towards the improvement of one of the main crops in the State.

The accompanying chart (Text fig. 1) shows graphically the fluctuations in area

and outturn of the ragi crop during the decennium. From it will be seen how great the fluctuations in outturn really are. The fluctuations in area are, as already stated, very slight.

POSSIBILITIES OF IMPROVING RAGI.

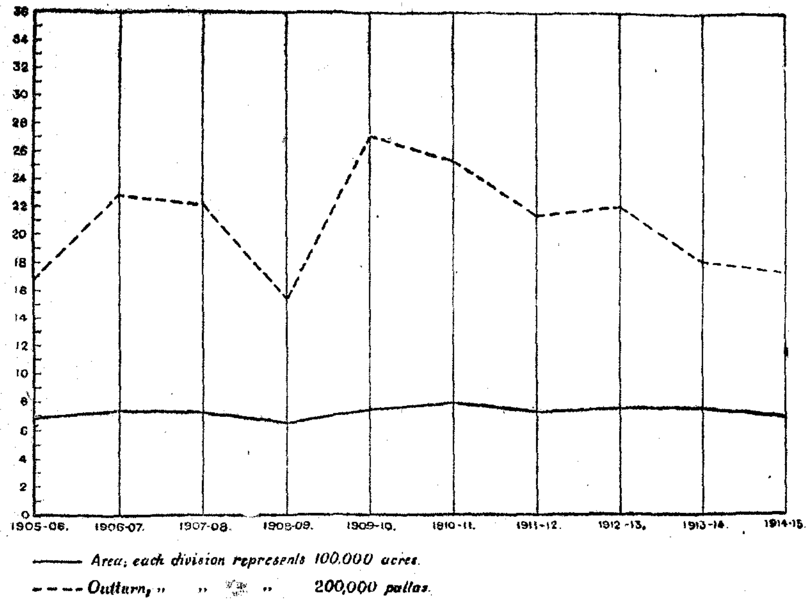
1. *Increase of area.*—As already stated a large and permanent increase in area under ragi during the next ten years is not to be anticipated. As a matter of fact it is hardly to be desired. The market for this grain is a restricted one and the scope for an export trade is small. It is true the price of ragi has almost doubled during the past thirty years but this has been accompanied by a corresponding increase in the value of other crops; so there is no more special inducement for the agriculturist to grow ragi now than there was thirty years ago.

Other and more profitable dry crops such as ground-nut are likely to occupy a continually increasing amount of the present ragi area so that any gain in area which may result from an increase in the total area under cultivation is likely to be counteracted by this movement. In fact, I think, considering the possibilities of increase yield per unit area, we may anticipate a shrinkage of the area under ragi by at least 15 or 20 per cent. However, such shrinkage is problematical and I do not propose to make any allowance for it in my forecast of increased production.

2. *Increase in outturn per acre.*—If there is little likelihood of an increase in area during the next decennium, the scope for an increase in outturn is great. As will be seen from the above table, the average yield of ragi for the decennium 1905-1915 was almost exactly 2½ pallas or 500 lbs. per acre. The average yield on the Hebbal Farm during the decennium was double that amount notwithstanding the fact that, on an average, much less manure was used there than is ordinarily used by the raiyats. This brings us to the question of how the yields may be increased.

(*a*) *Improvements in cultivation.*—The most important improvement under this head is that produced by the use of the improved plough. The improved plough serves two useful purposes; (*a*) it enables land to be cultivated in much less time thus allowing the agriculturist to cultivate more land and to ensure completing cultivation in the right season and (*b*) it leads to better cultivation. The results of early ploughing with an improved plough have been very striking on the Hebbal Farm. An experiment conducted for six years has shown, on an average, double the yield from early ploughing as compared with preparing the land shortly before sowing. There are probably at present between 5,000 and 6,000 improved ploughs in the State. In ten years this number should be iucreased to at least 60,000. If 50,000 of these are used for dry land we can take it that with that many ploughs about 10,00,000 acres can be ploughed. We can presume that 5,00,000 acres of this land will be used for ragi. If we estimate, on an average, 25 per cent increase due to the use of the improved ploughs, this improvement in cultivation should give us roughly 5 per cent greater average yield per acre over the whole ragi area.

(*b*) *Improvements through better seed supply.*—Breeding experiments on the Hebbal Farm have already given ragi strains which promise to be at least 20 per cent better yielders than the varieties at present grown in the State. Some of these strains are being tested in a number of different localities this year and seed farms will be organized to supply the seed in large quantities. The use of good seed is an improvement whicb can be introduced very rapidly, so within ten years we should have at least half the ragi area of the State supplied with improved seed. It should be possible also within the next few years to obtain strains yielding 30 per cent more than those now



Text figure 2—Chart showing fluctuations in the area under and outturn of Paddy during the decennium 1905-1915.

grown so that, at the end of ten years, we should have been able to produce an average increase per acre of at least 15 per cent over the whole area, due to improved seed.

(*c*) *Improvements in manuring.*—The value of ragi is not sufficiently high to warrant the use of expensive commercial fertilizers. However, it should be quite possible by improving methods of conserving cattle manure, planting manurial trees, increasing the cultivation of oil seeds and introducing green manures in suitable localities, to make available a considerable larger quality of manure for dry cultivation than is at present available. We may, I think, anticipate an increase of 5 per cent in the ragi yield due to better manuring. This phase of the question may, however, for the present, be left out of account.

The total increases that we may anticipate in the yield of ragi may therefore be placed as follows:—

	per cent.
Improvements in cultivation ...	5
Do from seed supply ...	15
Total...	20

PADDY.

Table No. V shows that the average area under paddy during the decennium was 726,870 acres. This is approximately 12 per cent of the total area cultivated and 77 per cent of the area under irrigated crops.

The fluctuations in area under paddy during the decennium were also compartively slight, the extent of fluctuation being about 20 per cent of the mean. The fluctuations in yield were, on the contrary, great, the outturn for 1908-09 being less than that for 1909-10 by 2,354,898 pallas or over 50 per cent of the average outturn for the decennium. The accompanying diagram (Text fig. 2), shows graphically the fluctuations in area and outturn for the decinnium. It reveals the same conditions as have shown for ragi.

As already pointed out, rice is not to be considered in the same light as ragi. In addition to being a food crop it is an important commercial crop. Moreover the rail-borne trade statistics show that our balance of trade in rice is unfavourable, the total imports of paddy and rice being, on an average decidedly in excess of the exports (*vide* Table VI). We are thus at present not producing sufficient rice for our home consumption. The excess of imports over exports, when compared with the total production of rice in the State is, however, not so great but that we should be able to make the State self-supporting by an increase in outturn per acre.

TABLE VI.

	Total production of paddy in pallas	Net imports in pallas of paddy	Percentage net imports to total production
1913-14	3,631,319	4,05,300	11
1914-15	3,475,576	8,43,753	24
1915-16	3,938,969	6,54,354	16

Increase of area.—On the whole it does not seem to me advisable to anticipate any great increase in the area under paddy during the next decennium. An increase in irrigated area under cultivation that we may anticipate can be more advantageously used for other crops such as sugar-cane, tobacco, potatoes, etc., which yield returns of higher value and the growth of which is not attended by the same dangers of soil deterioration. However with the completion of the Krishnarajasagara Irrigation Scheme a large amount of dry land will come under irrigation and a good part of this is almost

certain to come under paddy. An increase in area under paddy of 50,000 acres is therefore probable.

Increase in outturn.—The factor which can be made most immediate use of in increasing the outturn of paddy per acre and the results from which are likely to be the most marked is that of improved manuring. Paddy is a crop which is already a fairly profitable one. The accompanying table (Table V) shows the average outturn per acre for paddy during the past decennium as 5·7 pallas or over double that of ragi. Individual yields of three or four times that quantity are by no means unknown. This and the fact that the returns on money spent on manures are much more assured in the case of paddy, make it a crop to which commercial fertilizers can be applied with a fair chance of giving a profitable return on the money invested in them. This is, of course, provided that such fertilizers can be purchased at a moderate rate. In addition, paddy, in most cases, responds very well to the use of the green manures as fertilizers, and in fact green manures in some form or other are commonly used for this crop in certain Districts of the State. There is great scope for extending the practice of green manuring either by growing a green manure crop, or by utilising green leaves for the purpose. The spread of the use of green leaves as manure will depend, to a great extent, on the planting of manurial trees such as hongey, and the question of stimulating the planting of such trees should receive early attention and adequate recognition on the part of Government. It is not to be expected, however, that this will result in a greatly increased supply of leaf manure within the next ten years, so we must turn to the question of the introduction of green manure crops where they are not now being grown. This practice is at present extending, largely due to the demonstration work of the Agricultural Department, but certain obstacles stand in the way of its rapid spread. Firstly, under many of the channels in the Hassan and Mysore Districts, water is not being supplied in March and April, or April and May, for the two or three irrigations necessary for the growth of a green manure crop. This is an extremely important matter, and the question as to whether arrangements can be made for a supply of water during these months should receive immediate attention. Secondly, under tank irrigation, in many parts of the State, where green manuring is not now practised, it is difficult, or almost impossible, for the individual paddy grower to take it up simply for fear of his neighbours' cattle grazing off the crop. If green manuring is to be introduced rapidly in such cases it must be taken up by the great majority of the growers under any one tank at the same time, so as to make it a common interest to protect the crop from grazing. The Agricultural Department is exerting its energies more especially in this direction, and with some measure of success, but an additional inducement seems to be required either in the way of a small bonus, or, what would perhaps be more effective, a partial remission of taxes in the case of villages, where large nnmbers of raiyats agree to grow a green manure crop at the same time. This might be tried as an experimental measure in one or two districts for a year or so until the practice is demonstrated to the people as a paying one.

The possibilities of the increase of yield due to green manuring are large. Even where the practice is now followed it is rare that a sufficient quantity of manure is applied to produce the best results. It is a practice which, within the next ten years, should be extended over an area equal to at least one-third of the total paddy area in the State, and if we consider that the yield per acre can be increased through such manuring by 30 per cent, that would represent an average increase of 10 per cent for the whole paddy area.

Other manures.—The two chief classes of manures which have been shown to produce markedly beneficial effects on paddy in India are nitrogenous and phosphatic manures. Our only indigenous sources of these manures, in a commercial form, are oil cakes and bones. The possibility of increasing the use of bones is strictly limited by the supply. At present about 800 tons go out of the State each year. Even if we allow the low rate of 1 cwt. of bone meal per acre and suppose the whole of this supply were utilized for paddy, we should be able to manure only about 2 per cent of the paddy area in the State. It is possible that other sources of supply of phosphatic manures in India may be developed, and after the War, we shall be able to import such manures from abroad. However, it is hardly likely that we shall be able, within the next ten years, to do more than make a beginning with the introduction of phosphatic manures for paddy.

With regard to nitrogenous manures the position is different. The possibilities of increasing our local supplies are very great in the way of both oil cakes and artificial fertilizers, and it should be possible to organize a supply of such manures for paddy on a fairly large scale along with the supply for sugar-cane. If this is properly organized, an increase of 5 per cent in the yield of paddy throughout the State should be possible. The total increase of production due to improvements in manuring during the next ten years may then be put at 15 per cent of the present yield.

Improvements in cultivation.—The greatest improvement in cultivation is likely to be in connection with improvements in sowing methods. There are three methods usually practised in Mysore, *viz.*, transplanting from a seed-bed, broadcasting and drilling. This latter includes (*a*) sowing with an ordinary seed-drill and (*b*) sowing in furrows made by the ordinary country plough.

Extension of, and improvement in, transplantation will have a decidedly beneficial effect in increasing yields. Transplanting is extensively practised in the eastern districts of the State. Even in these districts, however, there is a big waste in the number of seedlings transplanted in a bunch, the number rising to as high as 20. It has been found that the transplanting of from 1 to 3 seedlings per bunch results, in most cases, in a higher yield, while it, at the same time, introduces a very important saving in the amount of seed used. The introduction of transplanting where broadcasting is now generally practised would bring about another important improvement, *viz.*, the conservation of the water-supply under tanks resulting in a much greater security to the crop. In the malnad portions of the State, where transplantation with few seedlings has not given uniformly good results, it is doubtful whether a decided change can be made in the immediate future. It should, however, be possible to introduce the improvement in one-fourth of the total paddy area during the next ten years. If we estimate the increase in outturn per acre resulting from this as likely to be 20 per cent, this would represent a 5 per cent increase on the total area.

Improvements in seed.—The number of paddy varieties grown in the State is very great. While there are very marked differences in yield and value between the different varieties, we shall not be able to get one variety which will be suitable for growth in all parts of the State. We shall probably require at least five or six different varieties to meet the requirements of the whole State, and these may be classified as follows :—(*a*) one or two short season varieties to be grown either as a second crop in the summer season or as a first crop under tanks with an insecure supply of water ; (*b*) medium season varieties for both first and second crops throughout the maidan and semi-malnad parts of the State ; (*c*) a variety of good quality and yield for transplatation in the

malnad; and (*d*) a variety of good quality and yield for hak (drill) sowing in the malnad. Our tests on the Hebbal Farm indicate that we already possess one or two varieties which, when they have undergone further selection and purification, will be suitable for general distribution in the eastern part of the State. Tests on the Marthur Farm should give us information in the next three or four years as to varieties suitable for the malnad. Within the next ten years we should have been able to have extended the use of better seed over about one-fourth the paddy area in the State, and this should lead to an increase which may be estimated at 5 per cent on the whole area.

If we sum up the possibilities of increase of production in paddy during the next ten years we get the following results:—

From manures, increase ...	15 per cent.
From transplantation, increase ...	5 ,,
From better seed, increase ...	5 ,,
Total...	25 ,,

JOLA.

An examination of the statistical table (Table V) shows that jola occupies about one-tenth the total cultivated area in the State and slightly more than one-fourth the area that is occupied by ragi. It forms the main food crop of the Chitaldrug and parts of the Shimoga District, while it is an important crop in the Mysore District as well.

The accompanying chart (Text fig. 3) shows that, as is the case with ragi and paddy, the area under jola cultivation has fluctuated only slightly, while the outturn shows a very marked fluctuation. The greatest fluctuation in area below the mean is 8·5 per cent, and above the mean, 10 per cent. The greatest fluctuation in outturn below the mean is 29·6 per cent and above the mean is 49·2 per cent. The extent of fluctuation in area is thus 18 per cent; that in outturn 78·8 per cent.

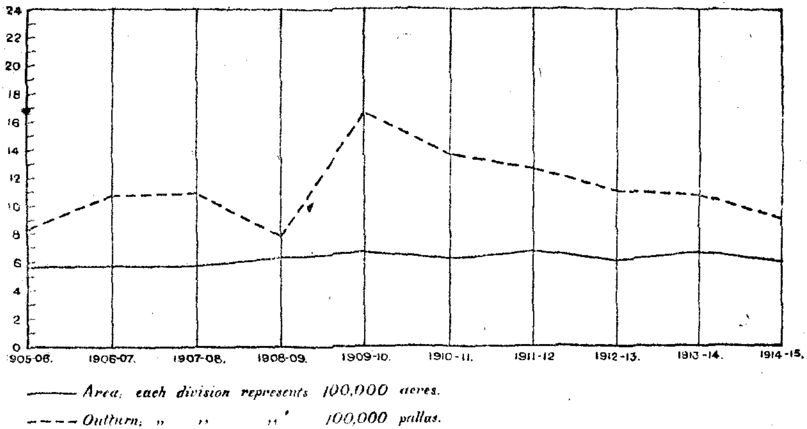
In a general way it may be said that the possibilities of increasing the production of jola are very much the same as those already described for ragi. Jola has, however, a more extended use than ragi, and in this regard the production is not so closely co-ordinated with the home consumption. This is shown by the following table (Table VII) in which the total production in the State is compared with the net export for the three years 1913-14 to 1915-16. The export figures are for jola and sajje (bajri) combined, but as the latter crop is one of very subordinate importance from an export standpoint, it may be taken as representing the net export of jola.

TABLE VII.

Year	Total production of jola in pallas	Net export of jola in pallas	Percentage of grain exported
1913-14	1,971,538	160,840	15 per cent
1914-15	903,929	128,000	14 per cent
1915-16	1,237,681	256,865	20·8 per cent

If we compare these figures with those given for ragi we see at once that jola plays a relatively much more important role as a commercial crop than does ragi. An increase in area under jola is therefore much more likely to occur.

As was found to be the case with ragi, however, there is an important commercial crop which is likely more and more within the next ten years, to compete with jola; that is cotton. The probabilities are all in favour of an increase in area under cotton



Text figure 3—Chart showing fluctuations in area under and outturn of Jola during the decennium.

1905-1915.

during the next decade and such increase will take place largely at the expense of jola.

The Agricultural Department has, up to the present, done comparatively little towards the development of jola cultivation except on the mycological side. Unlike ragi, which is singularly free from diseases and pests, jola is attacked by a number of them. The most important disease is the so-called *Kadige roga* or jola smut. Luckily there is a very simple and efficient remedy, or rather preventive, for this disease which the Department is devoting considerable attention to popularizing. Within the next ten years it should be possible to extend the use of this simple treatment to all the main jola areas of the State and the increase of production under this head should represent at least 5 per cent of the present production.

The yield of jōla in the State as given in the Season and Crop Report is exceedingly low, and improvement is likely to be produced most rapidly by work along two main lines.

(1) *Improvements in cultivation.*—The introduction of an efficient iron plough on a large scale in the black cotton soil areas will have a very beneficial effect upon the yield. Among other things such ploughs will enable the raiyats to keep their fields much cleaner than they do at present, a matter of very great importance. We may, I think, estimate a 10 per cent increase in the production of jola, due to improvements in cultivation, as possible within the next ten years.

(2) *Improvement of seed supply.*—Work in the improvement of jola by seed selection was begun on the Hebbal Farm, but it was soon found that the conditions there were unsuitable for jola. It is now proposed to take up this work on the Babbur Farm. Within the next four or five years we should have been able to obtain strains which are distinctly better than those now being grown, and by the end of the decade, should have organized a seed supply over a considerable area of the jola tracts in the State. We may, I think, look forward to an increase of 5 per cent in production under this head.

If we sum up the possibilities of increased production for jola we have the following :—

By improvements in cultivation ...	10 per cent.
By control of diseases and pests ...	5 ,,
By improvements in seed supply ...	5 ,,
Total...	20 ,,

I have intentionally ignored the possibilities of improvements through a better manure supply, as it does not seem likely to me that the supplies of manure which will be available within the next ten years will allow for their extended use on jola. Furthermore, the manuring of black cotton soil, the type of soil upon which much of our jola is grown, is a subject about which we know very little at present.

We have now disposed of the main cereal crops of the State. The question may be asked, in view of the recent interest taken in the increase of food supplies within the Empire, whether it would not be possible to introduce on a large scale such crops as wheat, which have a much wider market than the cereals commonly grown in the State. The area under wheat in the State is very small. The total area for 1914-15 was 2,659 acres. There seems little possibility of increasing this area to an extent that would make the crop in any way an important one even were it advisable to do so. Considering our climatic conditions we must, I believe, leave the question of increasing the supplies of grains commonly grown in the temperate regions of the world to the parts of India lying further north. This does not however excuse us from increasing the production of our own food grains as far as possible so that we shall become not only entirely self-supporting in this regard but shall also be able to export quantities to other less favoured parts of India. During the next two or three years the call of the Empire for us to do everything we can

to provide for others less fortunately placed than ourselves is an imperative one.

LEGUMINOUS CROPS.

Statistics for the most of our leguminous crops are not available. Some of them, such as *avare* and *togari*, are exclusively or almost exclusively, grown as secondary crops mixed with cereals, so that the actual area under them is difficult to estimate. Others are lumped together in the Season and Crop Report along with the minor cereals. The only ones which we need to consider separately are horse gram (*hurali*) and ground-nut (*nelakadali kai*). The question of ground-nut cultivation will be discussed under the heading Oil Seeds.

Horse gram is usually grown as a late crop and frequently takes the place of ragi or other cereals when these have failed through lack of timely rains. We have, however, seen that the area under ragi does not fluctuate greatly from year to year and an examination of Table I will show that a decrease in the area under ragi does not go hand in hand with an increase in the area under horse gram. Thus we find that, during the decennium 1905-1915, the year 1905-06 which shows the lowest area under ragi, *viz.*, 2,127,243 acres, also shows an area under horse gram which is distinctly below the mean for the decennium. On the other hand, the year 1912-13 which shows the highest area under ragi, *viz.*, 2,335,207 acres, also shows an area under horse gram much above the average. It is, therefore, to be doubted whether horse gram replaces ragi to the extent which is commonly supposed.

With regard to the yield of this crop two points should be noted. In the first place, it is ridiculously low averaging rather less than one palla per acre for the decennium; in the second place, the variations in yield is even more marked than in the case of the other dry crops mentioned, while the area shows a comparatively slight fluctuation. The accompanying chart (Text fig. 4) shows graphically the fluctuations in area and outturn.

Undoubtedly, one of the main reasons for the low yield of horse gram lies in the fact that the land upon which it is grown is usually poor and receives very little attention either as regards manuring or cultivation. The seed is usually sown broadcast and then left pretty much to its own resources. In areas where drill sowing is practised the resulting crops are distinctly better, and the introduction of the use of the drill for sowing horse gram, allowing as it would for one or two inter-cultivations, would undoubtedly lead to a decided increase in yield. Undoubtedly, much could be done in the way of selecting vigorous and high yielding strains, and it is probable that the Department will be able to separate one or two such strains and get them distributed on a fairly large scale during the next ten years. On the whole, we may, I think, be within the bounds of possibility if we fix the total improvement to be aimed at in the next ten years as 20 per cent of the total present outturn.

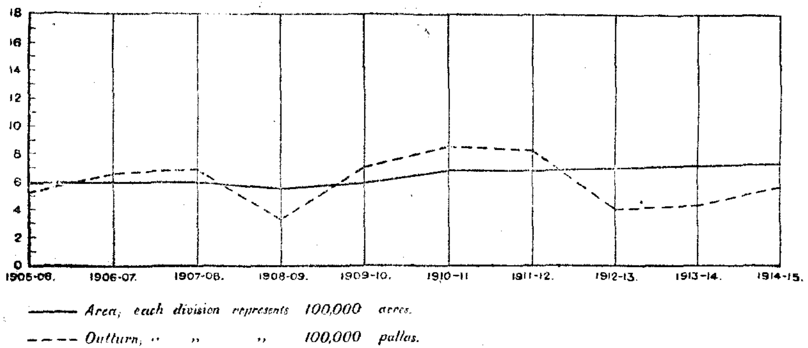
OTHER FOOD GRAINS AND PULSE CROPS.

We have no separate data with reference to the area and yield of the many other food grain and pulse crops in the State.* In the aggregate, they cover an area of between 8,00,000 and 900,000 of acres, but as they are individually for the most part unimportant it is unlikely that any very great increase in area or outturn is likely to occur in the case of any of them during the next ten years. However, should we as anticipated, be able to bring 6,00,000 acres more land under cultivation these crops will receive their share of the extra area.

OIL SEEDS.

Of the oil seeds at present being grown in the State the only ones upon which work has been taken up by the Agricultural Department are castor and ground-nuts.

* These figures have been made available for the first time in the Season and Crop Report for 1916-17, which has not yet been published, but a draft copy of which is in my hands.



Text figure 4—Chart showing fluctuations in area under and outturn of Horse Gram during the decennium 1905-1915.

Castor.—No statistics are available for this crop either as regards area or outturn. We know, however, that the area under oil seed crops other than gingelly is approximately 2,00,000 acres and are, I think, safe in presuming that castor occupies at least half of this area.* The crop occupies, for the most part, poor soils and the yield is low. Probably one and a half pallas (300 lbs.) is about the average yield which would represent a money value of Rs. 12 to Rs. 15 per acre. With a crop yielding such a low return as this the only chance of immediate improvement is by the introduction of improved strains. The Department is engaged in breeding work on castor, and the production of a strain giving 20 per cent better yields than those now obtained seems quite within the range of possibility. We may look forward to being able to place this improved seed on roughly one-half the area within the next ten years, which would represent a 10 per cent increase on the whole.

Gingelly which is probably the most important single oil seed crop in the State covered an average area of 99,615 acres during the decennium. No statistics with regard to outturn are available, but one of 1½ pallas to 2 pallas per acre may be taken as a fair average, which would represent a money return of about Rs. 30 per acre. As we have not commenced work on gingelly it is hardly likely that an appreciable increase either in area or outturn will be effected within the next ten years. Any increase in the value of the crop which may occur will result from an increase in price.

Ground-nut.—As already noted under the head of ragi, there is great scope for the increase in production of this important crop in the State. The figures of rail-borne traffic already given indicate that within the two or three years before the commencement of the War a very marked expansion of ground-nut cultivation had occurred. The crop itself is, under normal conditions of prices, one of the most profitable that can be grown on dry lands, and, unlike most oil seed crops, it seems to increase rather than to decrease the fertility of the soil. The rail-borne traffic statistics show that the imports of ground-nut oil are important, and, considering the value of the cake both as feeding stuff and as manure, the development of an oil seed crushing industry in the State to deal with our ground-nut seed seems to be one of the most promising lines of industrial development. Ground-nut oil seems certain in the future to become one of the most important edible oils in the State.

Unfortunately, no figures are available for the ground-nut area during the decennium under review. The first available figures are those contained in the Season and Crop Report for 1916—17, which gives the area as 77,305 acres. If the export and import statistics are to be trusted the area under ground-nut at the beginning of decennium 1905—1915 must have been very low. There must also have been a sudden rise in area about 1910, continuing till the outbreak of the war, when a fall probably took place. In 1912—13 the area probably amounted to at least 1,00,000 acres. On the whole, I think we may take the average area under ground-nut for the decennium to have been about 50,000 acres.

With the return of normal conditions after the war a very rapid expansion of the area under this crop may be anticipated. I think we may safely predict an extension to five times the average area for 1905—1915. One of the chief lines of work of the Department on the return of normal conditions will be the extension of the cultivation of this crop. As already pointed out this

* The area given in the Season and Crop Report for 1916-17 is 1,33,020 acres. It seems unlikely that the area under this crop has changed very materially during the past ten years, so that the average area may be put at 1,25,000 acres instead of 1,00,000 acres.

extension will probably be largely at the expense of ragi, but as the returns from ground-nut under normal conditions are about 50 per cent greater than those from ragi, this would represent a very large net increase in the Agricultural wealth of the State. The value of the ground-nut crop may be taken at Rs. 30 per acre, which for an area of 2,50,000 acres would give a money return of Rs. 75,00,000. If we deduct the average value of the ground-nut crop for 1905-1915, which we may put at Rs. 15,00,000, and the value of the present crops grown on the land which would come under ground-nut cultivation which, we may take as Rs. 3,00,000, that would give us a net increase of Rs. 30,00,000.*

SUGAR-CANE.

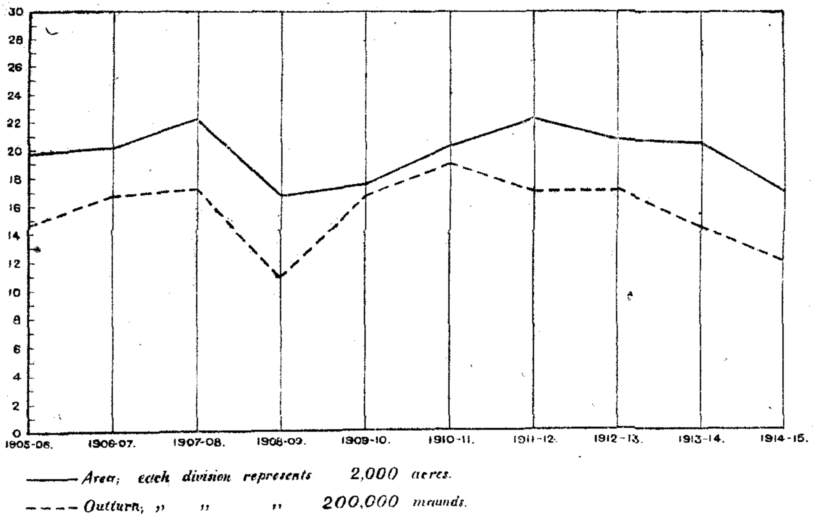
The average area under sugar-cane during the decennium was 39,420 acres. The accompanying chart (Text fig. 5) which shows graphically the variations in area and outturn from year to year is of considerable interest. In the first place, it shows that there have been decidedly greater fluctuations in the area under this crop than are shown by any of the main food crops of the State. The greatest fluctuation below the mean area (33,253 acres for 1908-09) was 15·6 per cent; the greatest fluctuation above the mean area (44,552 acres for 1907-08) was 13 per cent, giving a total maximum fluctuation of 28 per cent in area. The fluctuations in outtnrn, although large (the total maximum fluctuation was about 50 per cent), follow those in area much more closely than do those of any of the other crops we have examined. This is shown on the chart where a much greater approximation to parallelism between the curves of area and outturn is apparent than is to be found on the charts for the other main crops of the State.

The outturn per acre for sugar-cane is, as will be seen from the chart, considerably below 100 maunds to the acre. The average yield for the decennium was, in fact, approximately eighty maunds per acre. When we remember that yields of from 300 to 400 maunds per acre have been obtained by sugar-cane growers in Mysore, we see at once what great possibilities there are for the improvement of this crop.

Improvements in manuring.—There are, no douht, many factors influencing the yield, but undoubtedly the most important single one is the supply of manure. The organization and increase of the supply of manure for sugar-cane is, therefore, one of the most pressing questions which we have to face if we are going to improve this crop. The question is luckily a fairly straightforward one. We know that nitrogenous manures have a striking effect upon the growth of sugar-cane, so that our efforts in the immediate future should be directed to increasing the supply of fertilizers rich in nitrogen. With regard to other manures (phosphates, potash, and lime), we do not know that they will materially increase the yield, though quite probably a continued use of fertilizers which are almost purely nitrogenous may lead to the necessity of utilizing other manures as well to maintain high yields.

Sources of nitrogen which may be made available in large quantities within the next ten years are (*a*) oil cakes and (*b*) the products of the fixation of atmospheric nitrogen. The scheme already formulated for the fixation of nitrogen contemplates the annual manufacture of 10,000 tons of fertilizer which will contain approximately 20 per cent of nitrogen. This would correspond to about 40,000 tons of castor cake and 50,000

* Since the above was written there has been a marked increase in the use of ground-nut oil in Mysore more especially in the large towns. At the same time the use of the cake as a manure for sugar-cane is becoming rapidly popular. Under these conditions there seems reason to anticipate a considerable increase in the area under ground-nut irrespective of war conditions. Few things could have a more favourable effect upon the agricultural production of the State.



Text figure 5—Chart showing fluctuations in area under and outturn of Sugar-cane under the decennium 1905—1915.

tons of hongey cake, or about enough for manuring the whole of our present sugar-cane area. The possibilities of increasing the supply of oil cakes are also great. If the area under ground-nut increases, as I anticipate it will, and the cake is made available by the local crushing of the seed, we should have a sufficient supply of cake to meet all the demands which an extension of sugar-cane cultivation in the State during the next ten years is likely to create.

It is very unlikely that any rapid progress will be made in the increase of our manure supplies if the matter is left to private initiative. It is, in fact, a line of development in which the Government will have to take the lead. The establishment of a factory for the manufacture of calcium cyanamide or ammonium sulphate will, of course, be undertaken by Government, and the starting of large oil seed crushing plants to deal with our surplus oil seeds will also call for Government action. If both these questions are taken up for practical action during the next two or three years there should be no difficulty in increasing our production of sugar-cane per acre by 100 per cent within the next ten years.

Water-supply.—The next most important factor controlling the outturn of sugar-cane per acre is the soil moisture. Every sugar-cane grower in Mysore realizes the need of adequate supplies of water for this crop, but comparatively few seem to realize the evil effects of an over-supply. The supply of water for most of the sugar-cane grown in the State comes from tanks, in many cases a very uncertain source indeed. In one of the main sugar-cane growing taluks, *viz.*, Channarayapatna, the uncertainty of the water-supply has led to the almost exclusive cultivation of a comparatively poor variety of cane, *cheni*, which is known to withstand drought much better than either of the other two varieties commonly grown. In Shikarpur Taluk the water-supply is still more precarious, the cane in this case largely depending upon rain water. Similar conditions exist in many other parts of the State, and, in every case, prove an almost insurmountable obstacle to the introduction of expensive manures on a large scale. Sugar-cane growers are not prepared to invest comparatively large sums of money in fertilizers if they are faced with the probability of a serious reduction or complete loss of their crop through failure of water-supply.

The necessity of supplementing our water-supply through subsidiary wells constructed below tanks has been frequently urged, but little, if any, practical action appears to have been taken. Special efforts are being made towards the restoration of tanks and special facilities are being given by Government for this purpose. It seems to me a question worthy of consideration whether somewhat similar facilities could not be given for the construction of subsidiary wells under tanks whose water-supply is not assured.

Improvement of seed supply.—The introduction of more prolific sugar-cane varieties furnishes us with another means of raising the yield of sugar-cane. The Agricultural Department has, for several years, been engaged in testing sugar-cane varieties on the Hebbal Farm and has found at least one variety which, under the conditions existing on the farm, gives about 25 per cent higher yield than any of the varieties commonly grown in the State. This variety is now being introduced on a fairly large scale and its cultivation is likely to spread very rapidly within the next few years. Other varieties, either freshly originated from seed or imported from outside, are being constantly introduced for testing, and there seems every prospect of replacing, within the next ten years, our present varieties over at least half our area by others which will yield 25 per cent more per acre.

If we sum up the possibilities of improving the yield by the improvement of manuring, water-supply and seed, we may,

I think, anticipate an increase of about 100 per cent.

Extension of area.—Turning to the possibilities of increasing our area, we have first the probable increase under the Krishnarajasagar Reservoir, which has been estimated at 30,000 acres. The opportunities for extension under other large tanks such as the Marikanave, the Sulikere, etc., should furnish us with at least another 10,000 or 15,000 acres. Lastly, we have the possibilities of introducing sugar-cane into areas where it is at present but little cultivated. The malnad taluks of the State offer special facilities for sugar-cane cultivation, and the results of experiments already conducted on the Marthur Farm show that sugar-cane in that part of the State can be made to produce just as high yields as are now obtained in the best sugar-cane areas of Bangalore and Kolar Districts. It should not be impossible to increase our area by 15,000 acres within the next ten years by the opening up of practically new sugar-cane tracts in the malnad. A total increase of the area under sugar-cane by 60,000 acres should, I think, be a reasonable programme for the next ten years. Of this, probably one-half will be at the expense of paddy, but this area is so small as compared with the total area of paddy in the State as to be almost negligible.

Our present sugar-cane area of approximately 40,000 acres may be taken to yield a gross money return of Rs. 50,00,000 a year. With an increase of 60,000 acres and a doubling of the yield this should be raised to about Rs. 3,00,00,000 and this increase is, I believe, well within the limits of possibility.

ARECANUT.

The present area under arecanut is approximately 30,000 acres. Of this over two-thirds are in the Shimoga and Kadur Districts. Figures as to the average yield are unfortunately not availabe but from an investigation made by the department in all the important Areca areas we may take the average yield at 20 maunds per acre which, in normal years, represents a money return of approximately Rs. 110 per acre.

The present outturn can undoubtedly be greatly increased. Yields of 50 maunds per acre are obtained in Thirthahalli Taluk, while yields of as high as 60 maunds per acre have been reported from certain gardens in Tumkur Taluk.

Improvements in manuring.—An increase in the yield is certain to result from an application of manures. We do not know at present what manures are specially required by the arecanut tree, but a general manure containing small quantities of potash and phosphates and a larger quantity of nitrogen would be almost certain to give good results. The application of commercial fertilizers to arecanut would, in fact, probably yield almost as large returns on the money invested as would their application to sugar-cane. The question of organizing manure supply depôts in important arecanut growing centres, such as Thirthahalli, Sagar, Nagar, Koppa, Tarikere, etc., should be taken up in the near future. If this is done, we may, I think, anticipate an increase of about 15 per cent in the production of arecanut in the next ten years.

Control of diseases.—The other most important step to be taken in the improvement of arecanut cultivation is the stamping out of diseases. Work in this connection has been greatly handicapped by the War, but the prospects of a very great expansion after the War are bright. I think we may safely anticipate an increase of 15 per cent in production on accout of this work in the next ten years.

Extension of area.—The possibilities of the extension of the area under arecanut are considerable, but it is to be doubted whether we shall see much alteration in the area under bearing within the next ten years. There are, at present, no signs of any marked extension and when we consider

that it takes about ten years to bring a garden into bearing we can see that there is no likelihood of our production being greatly increased by increasing the area within that length of time. The total increase which I have estimated at 30 per cent, or about Rs. 14,00,000, will have to be brought about by increasing production on the existing area.

COCONUTS.

According to the Season and Crop Report for 1916-17 the present area under coconuts is approximately 80,000 acres, of which about 37,000 acres are in the Tumkur District. There has undoubtedly been a considerable increase in the area under coconuts in recent years, so that we may, I think, safely place the average area under this crop for the decennium 1905-1915 at 70,000 acres.

There are no statistics available with regard to the outturn from coconuts, but we shall probably not be far wrong if we estimate the money returns per acre at Rs. 120, or slightly more than that for arecanut. Experiments as to the manuring of coconuts are at present underway, and although it is still too early for definite results to have been obtained, there seems little doubt that the use of commercial fertilizers together with leguminous crops as green manures would lead to a very marked increase in yield. We may, I think, expect an increase of about 10 per cent in the next ten years from improvements in manuring these gardens.

Increase in area.—With regard to increase of area under coconuts there is undoubtedly a great field for expansion, more especially if some of the land at present under date groves can be thrown open. There is already evidence of a decided increase in area and this is likely to continue. An increase of 20 per cent in the area within the next ten years would not be too much to expect. However, we cannot expect more than half this area, if indeed that much, to have come into bearing by the end of the decennium and a 10 per cent increase of production owing to the extension of coconut cultivation is, I believe, all that can possibly be anticipated. In this connection should be pointed out the probability of large factories being started in South India in the near future for the utilization of coconut and other vegetable oils. If these are started the stimulus to coconut cultivation is bound to be very great.

An increase of 20 per cent in the outturn of coconuts, representing roughly an increase in production of Rs. 17,00,000, may be looked for in the coming decennium.

COFFEE.

The average area under coffee during the decennium was, according to the Season and Crop Reports, 107,425 acres. This represents the area under occupation for coffee and upon which taxes are being paid. The actual area under coffee is probably much less than this. Probably 75,000 acres would represent the actual area under cultivation. No statistics of the outturn of coffee are available, but enquiries made of coffee planters in the more important coffee districts lead me to believe that an outturn of from 2 cwts. to 2½ cwts. per acre may be taken as an average for the decade. The average net price for coffee on the estate during the decade works out at about Rs. 40 per cwt., which gives a money value of Rs. 100 per acre. This represents an average total value of Rs. 75,00,000 for the coffee crop of the State during the decennium.

Increase in outturn of coffee can result from (*a*) better manuring, (*b*) improved cultivation, (*c*) combating of insect pests and fungus diseases, and (*d*) production of higher yielding strains. Of these, the first three are the only ones which are likely to produce any effect within the next decennium. The production of higher yielding strains is a piece of work which will have to extend over many years before results can be attained.

With regard to manuring, the value of manures is well kuown among the more intelligent' planters. Lack of capital is largely responsible for the fact that manures are used so sparingly on many coffee estates. The uncertainty of the coffee crop which is practically made or marred by the rainfall during the blossom season has also much to do with the unwillingness or inability of coffee planters to manure their estates adequately. Lack of adequate cultivation is usually the result of an insufficient labour supply, and labour conditions within the next ten years are hardly likely to improve.

With regard to the combating of insect pest and fungus diseases there is considerable scope for improvement. Green bug which some years ago threatened the coffee industry, has been kept under control. Work on coffee borer, blackrot, rootrot and leaf disease, which is at present in progress, promises to result in a decided diminution of these pests.

If we consider the whole question of increasing the outturn from coffee, I think we cannot anticipate an increase of more than 10 per cent on the whole coffee area in the next decennium.

With regard to the extension of area under coffee there seems little likelihood of any marked increase taking place within the next ten years. The War is hitting this industry very hard, and it will undoubtedly take several years to recover. I am not one of those who consider the industry doomed to extinction, but an extension of cultivation can hardly be expected under present conditions. With the return of normal conditions, coffee planting will, in all probability, develop, but the effect of such development will hardly make itself felt within the next ten years.

COTTON.

The average area under cotton during the decennium was 94,790 acres. The fluctuation in the area under cotton is more marked than that of any other crop. It is purely a commercial crop and is, for the most part, restricted to the northern part of the State though considerable areas are under cotton in the T. Narsipur and Chamrajnagar Taluks of the Mysore District. In the cotton areas, jola and cotton largely replace each other, the areas under each depending largely on prices.

The figures given in Table V show that there has been a general tendency to increase in area during the decennium. Thus, the average area under cotton for the first five years of the decennium (75,369 acres) is much lower than that for the last five years (114,211 acres). If we examine the figures given in statement XIV of the Mysore Statistical Abstract for the past thirty years we find that in the first two decennia, there was a slow increase in the area under cotton and that this has become very much more marked in the last decennium. The averages are given in the following table.

Decennium	Average area under cotton.
1885—1895	49,614 acres
1895—1905	54,918 ,,
1905—1915	94,790 ,,

From this table, it will be seen that the average area under cotton has practically doubled within the past thirty years. The prospects for the future point to the probability of a further expansion. In a very suggestive paper read before the Royal Society of Arts, Prof. J. L. Todd has pointed out that the demand for cotton is increasing more rapidly than the supply. This authority considers also that the only country which promises a great increase in production within the next few years is India. While our cotton area is very small as compared with the total area in India, there seems every likelihood that we shall share in any general tendency towards increasing the cultivation of this important crop. If we add to this the possibility of our utilizing the cotton seed within the State in the manufacture of cotton seed oil the likelihood of extension becomes still greater.

Any large expansion of cotton cultivation will be at the expense of jola. As already

pointed out the production of jola exceeds the consumption by about 15 per cent. An increase of the area under cotton by 10 per cent of the total jola area, or roughly 60,000 acres, should therefore be possible without disturbing our food supply even if no increase in jola outturn per acre takes place. This would represent an increase of over 60 per cent in the average area under cotton, and I think we may safely anticipate an increase of 50 per cent in the cotton area during the next ten years. We are safe in taking the value of cotton per acre to be Rs. 5 more than that of jola, so that this substitution would represent an increase of production valued at about Rs. 2,50,000.

With regard to the outturn of cotton per acre there is undoubtedly great scope for improvement. While we have no figures as to our average outturn per acre it is, I think, safe to take it at not more than ten maunds per acre. This represents only two and a half maunds of clean cotton and is about one-third the average yield obtained in America.

How are we to improve our yields? In the first place we may say that experiments conducted up to the present do not appear to hold out very bright prospects for the introduction of commercial fertilizers and their use on a large scale seems hardly likely.

A more promising line of improvement is the breeding of better strains. This type of work has already met with considerable success in other parts of India and it is certain to yield similar results here also. The most casual inspection of any field of cotton in Mysore shows us that the plants are not uniform either in growth or in the production of cotton. In fact there is a very striking variation.

Work has already been commenced on the breeding of improved varieties, and within two or three more years' time we should have one or two varieties distinctly better than any thing we have at present. The value of the crop depends upon three factors (*a*) the total yield, (*b*) the ginning percentage, and (*c*) the quality and length of staple, and all of these are being taken into consideration in the breeding work now being done. We should be able to breed out varieties which will yield at least 20 per cent more than the ones now being grown, but in order to get these under extensive cultivation a careful organization will be necessary. In the first place, seed farms will have to be organized, and in the second place, small ginning factories will have to be established under Departmental control to ensure that the improved seed shall be kept free from mixture. The first step in this direction will have to be the establishment of a small ginning factory on the Babbur Farm.

Thirdly, if we are to produce a cotton with a better staple or a higher ginning percentage or both, it will be necessary to ensure to the grower an increased price for his product. Under present conditions, he is practically at the mercy of the local cotton merchant who gives him very little more for improved quality. The Agricultural Department will have, in the first instance, to assist all growers of improved cottons in this matter, but a determined effort should be made to form local cotton growers' associations who can organize the supply of seed and the sale of the cotton.

The growth of cotton is so centralized that it should be possible within the next ten years to distribute seed of improved strains of cotton over half the area under the crop. This world represent an increase of 10 per cent on the whole crop including the increased area. We should thus have an increase of Rs. 3,00,000.

Lastly, an improvement in cultivation by the introduction of improved iron ploughs will undoubtedly lead to an increased production. The distribution of 5,000 ploughs for black cotton soil areas within the next ten years seems a modest estimate, and this number should allow for the ploughing with improved ploughs of half the area which will

be devoted to cotton. I think we may anticipate that this will give an increased production of at least 5 per cent for the whole area, or Rs. 1,50,000 altogether.

The total increase of cotton production which we may anticipate within the next ten years, is therefore about Rs. 7,00,000 which is roughly 30 per cent of the value of our present crop.

The crops which I have discussed in this note occupy about 80 per cent of the total cultivated area of the State. They embrace practically all our important crops. Improvement is equally possible on the large number of minor crops as well and is likely to be appreciable within the next decade, but it is, I think, hardly necessary to enter into details with regard to these. If we succeed in making some approximation to the progress which I have indicated as possible during the next decade, I think we shall satisfy the most exacting critic.

Live-stock Production.

I have considered, up to the present, only that side of agricultural production which has to do with crops. Another important branch of production which has been ignored in all estimates made heretofore and of which there is no record in the Season and Crop Report, is the production of live-stock and live-stock products. We have, it is true, in the Season and Crop Report, Table A-4 devoted to live-stock but this shows us only the returns of live-stock at the quinquennial census and gives no information as to the amount of stock produced each year for export or for food purposes. There is also no record of such live-stock products as wool, hides, milk, butter and ghee, except the statistics of rail-borne traffic for the first two items which cannot, in any sense, be taken to represent the total production.

The returns for four quinquennial censuses (1899, 1904, 1909, 1914) are given in the following Table (VIII). I have omitted items such as horses, donkeys and camels, as their numbers are so small that they may be safely ignored. The figures show that the last two censuses have recorded a steady increase in live-stock of all kinds. The census for 1904, however, showed a smaller number of live-stock than that for 1899. Perhaps the fairest estimate of the live-stock of the decennium 1905-1915 would be the average of figures for the three censuses 1904, 1909 and 1914.

Table VIII

Year.	Bulls and bullocks	Cows	Buffaloes		Young stock	Sheep	Goats
			Bulls	Cows			
1899	1,489,814	1,397,780	88,021	4,59,958	1,323,235	2,345,794	1,566,152
1904	1,468,183	1,321,776	65,136	4,49,931	1,233,553	1,893,346	1,239,808
1909	1,631,871	1,581,341	89,510	4,74,730	1,238,868	2,738,199	1,762,036
1914	1,683,239	1,610,751	1,07,675	4,86,242	1,237,294	3,081,147	1,835,488
Averages from 1904 to 1914 ...	1,594,431	1,504,622	87,440	4,70,301	1,236,371	2,571,233	1,612,440
Percentage of increase in the decade ...	15 per cent	22 per cent	65 per cent	8 per cent	...	63 per cent	48 per cent

Some estimate of the actual production of cattle including buffaloes can be made from the figures given for young stock. The explanatory memorandum to the Season and Crop Report defines Young Stock as oxen (cattle) and buffaloes not old enough for work or to produce young. We may, therefore, take these figures to include all cattle up to two years old. The actual yearly production of cattle may thus be taken at one-half the total number given under young stock or roughly 6,70,000 head. Most of this surplus is not sold off as young stock but goes to replace older stock sold for draught purposes or for slaughtering. We may thus estimate that about 6,70,000 head of cattle and buffaloes are either disposed of each year or else go to increase the stock in the rayats' hands. In any case, they represent the annual production of cattle and buffaloes. It is hard to fix a value per head, but considering that they are not disposed of as young stock and that the cost of rearing cattle is low, I think we may assume a net value of at least Rs. 15 per head which would give a total annual value of Rs. 1,00,00,000 for the cattle and buffalo stock produced.

If we turn to the value of milk, butter and ghee produced in the State, we may, I think, put it safely at Rs. 5 per head of cows and female buffaloes, which gives us a total of about Rs. 98,75,000.

Sheep yield us three products, wool, hides and mutton, all of which are very important agricultural products. Most of the wool is sold for weaving locally, the sheep owners being paid in woven goods (kamblies), the result being that the returns to the sheep rearers are low, probably averaging about one-fifth of a rupee per sheep per annum. If we take this figure as the average returns on wool to the owner the total value, to the owners, of the wool from Mysore sheep works out at about Rs. 5,00,000 per annum. To this must be added the value of the manure produced by the sheep, which is another important source of revenue to the sheep rearer. This may be taken at about half the value of the wool, or Rs. 2,50,000 per year.

Finally, we have the value of the sheep slaughtered. The only basis for estimating is the number of sheep which is, as given in the table, 2,571,230. We may take one-third of this number, or approximately 8,50,000, to be young stock representing the annual production. These may be taken to have a value for mutton and hides of Rs. 3 per head, which gives us Rs. 23,00,000 as the total valueof the sheep produced.

The last item of live-stock is goats. Calculating on the same basis as for sheep we get from the total figures (1,612,440) an annual production of about 5,00,000 head which at an average value of Rs. 3 per head for meat and hides would give us Rs. 15,00,000 as the value of annual production. If we sum up the average annual production from live-stock, we obtain the following results:—

		Rs.
Cattle including buffaloes	... ...	1,00,00,000
Milk, butter and ghee	... ...	99,00,000
Sheep	... ...	26,00,000
Wool and manure ...	... ...	7,50,000
Goats	... ...	15,00,000
Total	...	2,47,50,000

Considering these figures, I think we may safely estimate the total annual live-stock production in the State at Rs. 2,50,00,000, an amount which it would be hardly wise to ignore in preparing estimates of agricultural production.

If we consider the probabilities of increase of agricultural production under live-stock it is necessary for us first of all to examine the increase during the past decade. The percentage increase between the census of 1904 and that of 1914 has been appreciable under almost all heads of live-stock, the rather startling exception being the young stock of cattle and buffaloes, where the increase has been very slight (see Table VIII). The possibilities of a further increase will depend largely upon the availability of fodder. We have no data sufficiently reliable to enable us to judge as to whether our fodder supplies are being fully utilized or not, but indications

are not wanting that in some of the districts, at least, the grazing lands are not sufficient to allow for any great increase in live-stock. An improvement in fodder crops and the introduction of the use of concentrated feeding stuffs would, however, undoubtedly enable us to support a much larger number of live-stock than we are now doing.

What is really more urgently required, however, than to increase the number of live-stock is to improve the quality, and there is undoubtedly great scope for work in this direction. As far as cattle are concerned we have several excellent draught breeds, but the average is poor and a determined effort should be made to grade up our cattle. From the milk standpoint both our cattle and our buffaloes are very poor. The possibilities of improvement are great, but progress is certain to be slow. This seems to me all the stronger reason why definite work should be commenced at once. We are unfortunately (I speak from an economic standpoint alone) very largely cut off from one of the chief sources of revenue from cattle and one of the chief incentives for live-stock improvement. Improvement of cattle from the beef standpoint is not likely to appeal to the people of Mysore.

What I have said with regard to cattle applies still more forcibly to sheep. Our sheep both from a wool and from a mutton producing standpoint are very poor. We do not get one pound of wool per sheep on an average whereas in Europe and America the average is four or five times as great.

To enable the whole question of the improvement of live-stock to be dealt with in a satisfactory manner the appointment of a special officer in charge of a separate branch of the Agricultural Department seems essential. The Madras Government have already organized a live-stock Branch in their Agricultural Department, and I believe the scope for useful work and the likelihood of obtaining practical results are at least as great here as they are in Madras.

CONCLUSIONS.

We have dealt with practically all sides of agricultural production and have reached the conclusion that there is great scope for development. I have ventured a forecast of the possibilities of increase during the next decade under practically all the main headings of production. Table IX gives a summary of the conclusions arrived at. In this table are given an estimate of our present area and production under each of the main crops, an estimate of the possibilities of increase in area and production and an estimate of the probable production at the end of the decade.

TABLE IX.

Crop	Present area	Estimated present value of crop	Estimated percentage increase in outturn per acre in ten years	Estimated area in ten years	Estimated value of crop in ten years
	Acres	Rs.		Acres	Rs.
Ragi including straw ...	2,235,586	4,54,29,000*	25 per cent	2,200,000	5,50,00,000
Paddy including straw ...	726,640	2,46,64,000†	25 ,,	775,000	3,26,00,000
Jola including straw ...	620,346	93,14,000*	20 ,,	620,000	1,12,00,000
Horse gram	619,406	44,21,000	20 ,,	620,000	53,00,000
Sugar-cane	39,420	58,97,000	100 ,,	100,000	3,00,00,000
Cotton	94,790	20,74,000	20 ,,	150,000	29,00,000
Gingelly	99,615	29,88,000	...	100,000	30,00,000
Oil Seeds other than Gingelly ...	199,603	39,92,000	10 ,,	200,000	44,00,000
Ground-nuts	50,000	15,00,000	... ,,	250,000	75,00,000
Coconut	70,000	84,00,000	20 ,,	77,000	90,00,000
Arecanut	27,350	37,78,000	30 ,,	30,000	54,00,000
Coffee	107,425	80,00,000	10 ,,	110,000	90,00,000
Remaining crops	1,248,030	3,74,40,000	10 ,,	15,00,000	4,95,00,000
	6,138,211	15,78,97,000	...	6,732,000	22,48,00,000
Add for live-stock	...	2,50,00,000	20 ,,	...	3,00,00,000
	...	18,28,97,000	...	...	25,48,00,000
Or	...	18,00,00,000	...	...	25,00,00,000

* Includes straw of an estimated average value of Rs. 6 per acre.

† Do. do. Rs. 2 per acre.

As will be seen, my estimate of present production differs considerably from that prepared by the Agricultural Committee as also from that given in the Statistical Abstract. Whether the estimate I have given should prove to be less or more accurate than the others, it has the merit of being based upon average figures for a considerable period.

The estimated increase in value of agricultural products in the State is about 40 per cent. I had previously, in addressing the Standing Committee of the Economic Conference, expressed the opinion that a 50 per cent increase within ten years would be possible, but at that time I had not studied the question as carefully as I have now done. Few will, I think, be prepared to criticise me for reducing the estimate, and I think most will agree that an all round increase of 40 per cent is on the one hand not so high an estimate to appear impossible of accomplishment and on the other hand high enough to incite us to strenuous effort towards its attainment.

According to the Report of Industries Advisor Board during 1917 the following new Industries, are known to have been initiated in South Africa, and in many cases to have commenced production:—Manufacture of calcium carbide, manufacture of chloride of lime, iron smelting, manufacture of alcohol, motor fuel, wattle bark extraction, toy making, manufacture of sauces and other condiments, glass bottle manufacture, manufacture of shoes and floor polishes, manufacture of sulphate of ammonium, detinning of scrap tin, asbestos manufacture, tin smelting, production of arsenic, manufacture of starch from maize, antimony smelting, meat canning, manufacture of lead shot and pellets, manufacture of paints and distempers from local materials, chicory production and preparation, manufacture of glue and size, and manufacture of raw wax from by-products of sugar-cane. In addition to the above, a cement factory capable of manufacturing 720,000 bags of 188 lbs. each has commenced production near Mafeking.

AGRICULTURE IN INDIA AND HOW TO IMPROVE ITS CONDITION.

By Prof. B. Mukherjee, M.A., F.R.E.S.

THE subject is vast and complex and the limits set upon the paper compel only a brief treatment of the essential heads.

There is almost a Rockefeller's wealth buried in each district in India. The problem of modern India is largely a problem of her agriculture—the problem of harnessing the omnipotence of her soil. He who recreates our land will recreate India.

The only two ways in which an industry can be improved are:—

(1) Means to increase its output, and
(2) Means to reduce costs of production. Scientific agriculture and Co-operative finance—these two alone can and will work a miracle in Indian agriculture and will thus help to transform India.

The question of improving Indian agriculture has long been recognized to be one of the most important economic problems of modern India. The importance of agriculture in the national economy of India can hardly be overestimated. It is the one industry by which India stands or falls. It is her very life. It is the mainstay of our people, supporting as it does, directly by itself or indirectly by its subsidiary industries about 218 millions of souls or about 70 per cent of our total population. It is thus the foremost industry of the country. The annual value of the agricultural produce of British India alone has been recently estimated at £1,000,000,000. Further, agriculture is the main strength of our finance system. Land in India is regarded as the property of the king and the land revenue which it yields—it is fruitless to argue here whether it is taxation or economic rent—

forms a very large part of our total revenue. Again, our vast foreign trade depends largely upon our agriculture. In a way, it thus helps to maintain the stability of our exchange which is of prime importance to a debtor country like India. A failure of our jute or wheat crop not only causes loss to our cultivators but it also sharply reacts on our exchange through the breakdown of our exports. Consequently, the well-being of our agriculture must be a matter of supreme importance for both the people and the Government.

Such being the importance of agriculture in India, anything that promotes its productivity must be earnestly desired. Scientific agriculture alone can increase that productivity and can help us to grow two blades of corn where we now grow one. The possibilities of scientific agriculture may be said to be limitless. It has already worked wonders in those countries where it has been systematically applied. Take for instance, America. The American farmer is a new product in civilisation running the land as a great factory. The rude old agriculturist is being fast replaced by a highly educated first-class captain of industry. As a writer describing the miracles of new agriculture in America once wrote :

"Each farmer now works with the power of five men. The farm has become a factory. Four-fifths of its work is done by machinery which explains how we can produce one-fifth of the wheat of the world, one-half of the cotton and three-fourths of the corn although we are only 6 per cent of the human race. Roughly speaking, the time needed to handle an acre of wheat has been reduced from 61 hours to 3 by the use of machinery. Hay now requires 4 hours instead of 21, oats 7 hours instead of 66, and potatoes 38 hours instead of 109........ There are now 15,500 farmers who have graduated from agricultural colleges. The Agricultural Department at Washington has become the greatest aggregation of farm scientists in the world. To maintain this Department, Uncle Sam pays £2,200,000 a year...... .."

"Place your finger on the pulse of your wrist and count one—two—three—four With every four of these quick throbs, day and night, a thousand dollors clatter into the gold-bin of the American farmer."

"The American farmer earns enough in 17 days to buy out the Standard Oil and enough in 50 days to wipe Carnegie and the Steel Trust off the industrial map. One American harvest would buy the kingdom of Belgium, king and all ; two would buy Italy ; three would buy Austria-Hungary, and five, at a spot cash-price would take Russia from the Tsar"*

These are cold facts and what happened in America may very well happen in India as well. It is a dream that has a tinge of reality about it. The only thing we need now is for some one to give us a lead—for some one to cry Eureka and to begin action.

The possibilities of scientific agriculture has been actually demonstrated in India in the various agricultural farms all over the country. A few instances might be quoted.

(1) The Burdwan experimental farm proved that green jute ploughed into a rice field increased the profit from Rs. 20 to Rs. 55 an acre and that a mixture of saltpetre and bone dust trebles the crop and raises the profit from Rs. 20 to Rs. 100 an acre... "Apply even a tenth of this profit to the forty million acres of rice in Bengal and you will have some idea of the wealth which is waiting to be lifted."

(2) Experiments by Bengal Agricultural Department at Barasat in 1915 :—

Jute.

	(out-turn per Bigha)
Local manuring ...	... 3¼ maunds
Nitrates ...	... 6¾ ,,
Value of increased out-turn ...	... Rs. 26
Cost of Nitrates	... ,, 4
Net profit per bigha—	... ,, 22 = Rs. 66 per acre.

* Casson. *American Review of Reviews*, May 1908.

(3) *Cotton.*

	out-turn in lbs.
No manure	403 lb.
Nitrate and super-phospate...	679 lb.

(Report on Cotton Improvement in Berar, Clouston)

(4) *Rice.*

No manure	492 lb.
30 lb Nitrate of soda with 15 lb. super-phosphate...	912 lb.

(Chilean Nitrate Leaflet).

(5) *Oats.*

	Out-turn per acre. Grain	Straw
No manure	742 lb.	994 lb.
Saltpetre 2½ mds. per acre...	1,476 ,,	2,150 ,,

(Report, Sibpur Experimental Farm 1901-2)

(6) Report, Burdwan Agricultural Sta-on 1908-09 :—

Jute.

	Out-turn per acre in maunds (80 lb.) Plant	Fibre	Cost of manure.
No manure ...	375	18½	...
Bonemeal ...	405	19½	22 8 0
Cowdung ...	450	23	4 6 0
Do Super-phosphate	525	26	13 12 0
Do Saltpetre ...	600	29½	23 12 0

It is useless to multiply instances but the ne inference that may be drawn from a udy of the above figures is that if the rinciples of scientific agriculture and good oil dressing are universally applied, India ould soon be an immensely rich country nd her agriculture will at once be the pride nd strength of India. Nitrates are perhaps ne manures for the soil in India and considering how old a country India is and onsidering also the fact that the Indian ultivator has for ages past worked the soil p to its utmost capacity without giving it ny manure dressing, it is high time we oked more carefully into it from now. We an get almost inexhaustible supplies of itrates from Chile in South America. Any ressing that we give to the land is in reality n investment of capital that will pay its wn way more than a hundred times over.

There is another serious argument for advocating a souud and liberal system of soil dressing in India. India is an old country and the arts of tillage began to be practised in this country long before that in other countries. This continual whipping up of land for ages past has resulted in a considerable diminution in the soil's fertility throughout India. The average outturn per acre that we find recorded by the court officer of Emperor Akbar of Delhi is much greater than the average outturn per acre to-day. Indeed, so long as cause is followed by effect, it could not but be otherwise. Nature will stand many things but she cannot be cheated and if we in India mean to go on reaping crops from the land for ever without giving it any manure we can only expect that the soil would become less fertile. Uptill now, in the history of India there was one cause only—the necessity of providing the internal food supply—that reduced the fertility of the soil. That was bad enough in all conscience. Now however, two more powerful causes—besides the above necessity of raising an adequate home supply—are continually at work which are practically denuding the oil of its wealth of fertility. These two are :—

(1) India has become a very important exporter of raw products only. Her position in the international markets is one of an exporter of agricultural products. Our agricultural exports in 1916-17 were valued at 103 millions. Now, as Dr. Voeleker has pointed out, to export agricultural products is practically to export the soils fertility. It comes to this then, that from our position, we are compelled to export, *every year*, a very large amount in land fertility. Now if this thing goes on uninterruptedly without anything being simultaneously put into the land by way of soil dressing, how long can we expect to find a fertile soil? It would be a mad and concentrated folly to see our lands daily being deprived of the best wealth. It is exactly

like a prodigal living on his capital—aye, more—exporting his capital for a very inadequate return. And no country can long last on such conditions. A country that is living on capital is not very far from collapse.

(2) The second reason is this: Professor Marshall—the greatest living authority oneconomics—in a private note which he submitted to Mr. Lloyd George when he was the Chancellor of the Exchequer in 1908 (published as a Parliamentary paper C—321 of 1908) throws out a hint that the country to which the future will belong in this world and the country which will be in the strongest economic position in the future will be the country that will have the greatest relative advantage in the production—not of munitions, not of ships, not of manufactures, but—of agricultural products. The prophecy has come too true. The greatest economic weapon in the hands of the Allies against the Germans is the threat to deprive them of raw materials and agricultural products after the war. There will be an absolute scarcity of raw materials and food products in the future. If India is to retain her advantageous position as a great producer and exporter of raw products she must take quick and effective steps to retain her soil's fertility. That is what makes a policy of liberal land dressing a matter of vital necessity to India. The cost might well be regarded as a premium for the insurance of India's soil fertility and soil wealth. And the cost is by no means excessive considering what Chile can give us in nitrates.

The next most important thing in the way of agricultural improvement in India is the absence of cheap money in the hands of cultivators. The greatest industry in the country with an annual outturn of 1,800 crores of rupees is without any banking system. The 250 millions of people are devoid either of cash or credit.

Agriculture in all parts of the world is carried on by means of borrowed capital and India is no exception to the rule. The cultivators in India as a matter of fact, almost entirely thrive on borrowed capital. But this is exactly the halter wherewith the Indian cultivator hangs himself. The Indian cultivator borrows from the *mahajan* at extraordinarily high rates of interest. 75 per cent is an usual rate while a 150 per cent rate is not uncommon. It does not require a long stretch of the imagination to picture the condition and prospects of an industry which has to pay a 75 per cent rate on its working capital. No industry can prosper with such preference shares. The total indebtedness of our cultivators has been variously estimated from 375 to 500 million pounds. Supposing the whole of it pays the modest rate of 18 per cent only—which is far too low as compared with the actual rates—the annual tribute which agriculture pays—the annual "drain" which the land in India shoulders—comes up to about 90 million pounds annually. It is idle to expect any industry to prosper which has to pay year in and year out such a heavy burden for its normal working capital. It is almost a miracle that the industry still stands as it does. The earth never rebels against authority. It never gives back but with usury what it receives. Agriculture is the finest national property of the people of India—much better and more important than cotton, coal and jute all put together. Yet it is the most badly managed property we have. The prodigal nation is sleeping still. It shows no sign of waking yet. And yet all the time, what on immence quantity of money values is running to waste! Properly organized, this our finest property can start the greatest trade boom in the world—"it can bring about the mightiest economic revolution and it can find employment for man and beast."

"The power which stands in the way of India's economic development," said Sir

Daniel Hamilton, "is the power of evil finance—the want of a banking system for the people. The people have many bankers but no bank. The land lies blighted by the shadow of the Mahajan. Go where you will you find the people weary of waiting for a money monsoon which never breaks. They look to the heights of Simla and the plains of Delhi for the cloud with the silver lining, but the cloud never sparkles into showers." The people in the Deccan cultivate cotton worth only Rs. 30 to Rs. 40 per acre and cannot grow sugar-cane worth ten times as much—well, because they have no money and are already hopelessly indebted. "The weavers are held by the same evil power. The Mahajan sells them his yarn at his own price and takes over the cloth at his own price and so the weavers and the hand-looms languish and the web of India's life is cut short. I go down to Orissa and the cry is the same. "We want bunds to hold up the rainfall and grow rice, but bunds cost hundreds and thousands of rupees and how can men with an income of two or three annas a day find hundreds and thousands of rupees." So the people have to go without the rice they covet and Orissa for want of bund is being washed into the Bay of Bengal. I go up to Bihar and find the same deadly mildew at work—blight, blight, blight, everywhere. The Mahajan still lies safely entrenched behind his money-bags while the victims of his silver bullet lie all around in heaps. When is this robbery to cease?" The long arm of law is practically powerless to protect these poor people from this annual plunder. Usury has become a pestilence in the land. The country is literally groaning under it, with our agriculture following old agelong methods, wholly innocent of the principles of scientific agriculture, with our cultivators groaning under a colossal debt of £500 millions and paying an annual tribute of say from 90 to 200 million pounds, with the majority of the people sunk in illiteracy, to hope for an improvement in our agriculture is practically to whistle for the moon. As Sir Daniel Hamilton put it "The great industry of the four-fifths of the Empire is still without a banking system, *250* millions of people without cash or credit ......We have given the people a railway system which removed their surplus have not yet given them a b to bring back the price. Tl the surplus crop and the trader takes the money and the devil takes the people......The want of credit among the masses is a chief cause of unemployment and unrest. Multiply credit and you multiply employment and peace for all. An increase in the purchasing power of 315 millions of people will start the greatest trade boom the world has ever seen and create employment for man and beast......In the death of the Mahajan, India will find life...Until the banking system for which the Mahajan stands is dead, India will not live. The raiyat is India and India is the raiyat."

The best remedy for all these evils is the application of the principle of co-operation in agriculture. The Co-operative Credit Societies Act (1904) is a constructive Act and the principle which it enunciated has, like alchemy worked miracles. When the Government passed this Act, it really built much better than it knew. The task before us is arduous but clear—a quick and a vigorous extension of Co-operative Societies to every nook and corner of the country so that in the years to come the nightmare of agricultural indebtedness in India will pass away as mist before the rising sun. It will free 250 millions of people from their slavery to the Mahajan. It will make them free. It will make them men.

The above two, *viz.*, scientific agriculture and co-operation, are the two essential means of improving Indian agriculture. The limits set upon the paper make a treatment of other points impossible. But I will state here a few more points only which would also help Indian agriculture :—

(*a*) The extreme sub-division of holdings and the continual partition and repartition of land at each generation make land improvement and adequate tillage highly difficult. Consolidation of land holdings is eminently desirable. The Government is considering the problem.

(*b*) Buyers of raw produce ought to combine in order to prevent adulteration and mixing of inferior stuffs, *e.g.*, cotton, jute, etc.

(c) Co-operative production of agricul- l industries.

y freight on manures should educed.

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SOME SOUTH INDIAN VILLAGES.*

BY RAJAKARYAPRASAKTA
RAO BAHADUR M. SHAMA RAO, M.A.

It is with very great pleasure and interest that we welcome this book being the first volume of Economic Studies by the Professor of Indian Economics in the University of Madras. The study of Economics has always been a favourite subject with the students of colleges in Southern India, but it is for the first time that these students have been made to learn in a practical manner the problems which hitherto were taught to them in the form of College lectures by Professors who could lay no claim to any direct contact or connection with the rural or urban conditions of the country. Dr. Gilbert Slater is apparently an enthusiast in his subject, and the "village questionaire" which he drew up for the use of those of his students who were willing to help him in his work, is very comprehensive, though from the nature of the circumstances the answers to some of the questions will have to be accepted with very great caution.

It appears to us that Dr. Slater exercised wise discretion in departing from Sir Theodore Morison's suggestion in his inaugural address to the Madras Economic Association in January 1913, for a sociological and statistical survey of a typical Indian village. Mr. Slater rightly says that no single village can be typical of the Presidency of Madras, and the neighbouring states of Southern India. Perhaps in the days before the present facilities of communication were established and while the present conditions of land holding and disposal of produce were unknown, to a certain extent it may be said that villages were more or less alike in their isolation, and the economic conditions of the several villages were not very much dissimilar. Of late, however, while no doubt Government periodically publishes large volumes of statistics relating to the extent of lands under cultivation, the kinds of crop grown, the quantity of produce raised and other details, it must to a large extent, be admitted, that the interest of Government as represented by its Revenue Department, has grown somewhat passive in the development of agricultural prosperity. This attitude is, it may be surmised, more or less due to the substitution of a fixed cash assessment for a long term of years, in place of the division of the annual outturn that was more or less the rule before the present Revenue Survey, and Settlement came into vogue. The efficiency of the Revenue officers of the past when crop sharing prevailed, was judged by the extent of land they brought under cultivation annually, and by the increased share of the produce which their efforts brought to the Government coffers. At present the Revenue officer is under no such obligation, and considers himself to have done his duty by collecting as large a portion of the fixed annual assessment as he could from the cultivators, irrespective of the particular circumstances affecting them except in abnormal years of scanty rainfall when he may receive special instructions from Government as regards his proceedure for any particular year. The development of communications to which reference has been made above, has increased the demand of foreign countries for Indian produce, and thereby given a value to the lands which are now eagerly purchased by wealthy traders, and money-lenders whose interest in the land is very often confined to regularly getting from their tenants the stipulated rent. In the olden days when limitations existed on transport of grain, and the substitution of Industrial crops for food crops was not always as

* Economic Studies. Vol. I. Some South Indian Villages. Edited by Gilbert Slater, M.A., D.SC. University Professor of Economics, Madras University, Madras. Oxford University Press, Bombay and Madras.

profitable as it has become now on account of foreign demand, there was a sort of rude plenty in the land inasmuch as the excess of food grain in the possession of its owner, could only find its way into the mouths of his near neighbours. It may be noticed as a curious phenomenon in the present-day rural economy that while a village may be actually growing twice or thrice the quantity of corn needed for the consumption of its inhabitants, a portion of these inhabitants may still be forced to live on one meal a day. The landlords whose tenants these may be, may be unsympathetic, and sell the grain in outside markets, and utilise the proceeds to satisfy their own fancy by the purchase of foreign articles of luxury. In other ways also the rural cultivator may be placed at a disadvantage by the landlord, but for our present purpose what we have said is enough to indicate the differences that have come to establish themselves between village and village, some villages being advantageously situated near to railway lines, while others being still isolated and continuing to some extent under the old conditions. It must be acknowledged therefore that in the absence of similarity of conditions the selection of a particular village cannot serve as a type, and Dr. Slater's choice of a number of villages is therefore to be commended.

At the same time, the method of investigation adopted by Dr. Slater labours under some disadvantage as compared with that adopted by Dr. Harold H. Mann, who, in his book *Land and Labour in a Deccan Village* has confined himself to a single village. A further advantage that the latter possessed was that he was assisted in his investigations by his assistants at the Poona Agricultural College who were several of them, University graduates in Science and in Agriculture. Dr. Slater's assistants on the other hand were University students who cannot be credited with the same amount of knowledge and worldly experience as Dr. Mann's assistants. In spite of such disadvantages Dr. Slater has managed to guide his assistants on the whole, on right lines, and a vast mass of information has been collected in the volume published. The inquiry related to twenty-one villages of which one was in the Ramnad District, one in the Tinnevelly District, one in the Tanjore District, one in North Arcot, one in Chittoor, one in the Kistna, three in Malabar, one in the Mysore State and one in the Cochin State. One of the villages was investiged by Dr. Slater himself, and the remaining by his students. The questions were very searching, and related to almost every aspect of village life. It is not possible to know what steps Dr. Slater took to check the accuracy of the figures given by his assistants or to check the value of the information collected by them. Where, however, the figures have been collected from the village official registers such as those relating to the total population of village, number of families and individuals in each caste, number of homesteads, number of holdings, area under each of the principal crops, number of cattle, number of schools, we may be said to be on firm ground, but where the information relates, say, to the customs with regard to feeding of domestic animals, the percentage of the cattle-dung used as manure, chief insect-pests and methods for combating them, cost of cultivation per acre of land, average earnings of weavers, estimate of the quantity of village-produce sold out of the village, number of families which have made savings, rural indebtedness and its causes, estimated annual expenditure on religious festivals, the number of books in the village and their character, it must be acknowledged that the information collected may not be as valuable for purposes of generalisation as we could wish. The concluding observations of Dr. Slater, based as they are generally on the data furnished by his students, suffered to some extent by the possibility of their being open to correction in the light of more accurate information, which may be gathered in the future. Within the limits of this paper, however, it is not possible to dwell at length either on them or on the several subjects of investigation included in the book under review. We hope to be able to do so on a future occasion. In the meanwhile we shall content ourselves by saying that Dr. Slater is rendering real service to the country by the line of investigation he has started, and it is hoped that he will be able to publish more volumes of such useful and instructive information, not merely for the benefit of the University students but also for the benefit of students of Economics in general.

THE I. A. O. S.

BY K. S. ABHYANKAR.

THE economic and political condition of India has many points of similarity with that of Ireland. That Country has seriously undertaken the solution of the problem of Rural reconstruction. A similar problem is facing us here. It, therefore, behoves us to study the work done by the Right Hon'ble Sir Horace Plunkett and his colleagues, Father Thomas Finlay, Robert A. Anderson, G. W. Russell, and others. The true significance of that movement, it has been truly said, is that it is an attempt to build up a new social order in Ireland.

Previous to the introduction of the co-operative movement, there was widespread economic depression and consequent depopulation in the Irish Country side. Nearly half the population depended on agriculture for their livelihood and there was not only "economic poverty, but also a poverty of industrial character and of social life." The bulk of the agricultural produce was sent to England but with the advent of the new era of business habits the Irish people with their antiquated methods failed to satisfy the English market which was captured by the Danes. Rural Ireland was completely disorganized. A state of helplessness prevailed. There grew up a belief that a panacea was to be looked for only in political changes. Sir Horace Plunkett, however, is better than a politician. "He is a Statesman with a creative mind." He made it his life-work to introduce better farming and better business in rural Ireland.

Sir Horace was born in 1854 in an Irish noble family. After taking his degree at Oxford in 1877, he went to the United States of America and engaged in ranching till 1889. He still goes to United States for a few weeks of every year and thus keeps himself in practical touch with agricultural affairs in that Country. He was appointed to the Indian Industrial Commission chiefly on the strength of his practical knowledge of agricultural development. Had he been able to come over to India he would surely have given us sound and valuable advice regarding the problems of agricultural development and co-operation in this country. He was unanimously elected Chairman of the Irish Convention, a body representing Irish men of all shades of political opinion. This shows in what high esteem he is held by Irish men of all parties. He has, moreover, been gifted with the power of 'dragging people out of their own private and proper work and make them do his work instead.' He has thus gathered round himself, artists, poets, literary men and clergymen along with those who were personally interested in farming.

The English Co-operative Union had interested itself in the spread of the co-operative movement in Ireland, but Irish leaders found the conditions most favourable for Dairy Societies. Credit Societies were thought of later on, the Pioneer Bank being opened at Doneraile early in 1895. There are only about 230 Credit Societies in Ireland and they are practically considered to be the neglected orphans of the movement. The following remarks of Sir Horace, however, bring out the importance of agricultural credit. "So far at least as the poorer members of the community are concerned I hold that Co-operative credit is by far the most valuable branch of co-operation. I do so because I found in my own organizing days that once the mysteries of finance could be explained to a body of men, all the other forms of co-operation become comparatively easy."

The Irish Agricultural Organization Society was formed in the year 1894. Its aim was thus stated in an official statement issued by that Society. It is "an association formed by those interested in hepling the

Irish farmers to adopt modern methods of business which will enable them to keep pace with the growing needs of their industry and to meet foreign competition by adopting the ideas which make our foreign rivals formidable. It aims specially at organizing and looking after co-operative societies for the production and marketing of butter, the joint purchase of seeds, manure and agriculture implements, and the joint marketing of poultry, eggs and flax. It also assists in starting and developing agricultural credit banks. The I. A. O. S. does not trade; but helps societies by advice and by visits from its organizers."

The formula "better farming, better business, better living," which this society adopted for expressing its aims has been already referred to. Soon after its foundation the I. A. O. S. invited Mr. Wolf and with his advice adopted the Raifeissen type of unlimited liability societies without share capital. In 1896, a representative Committee called the "Recess Committee"—as it worked in the recess between two Sessions of the Parliament—examined the agricultural condition of Ireland and recommended that a Government Department of Agriculture should be formed to supplement the efforts of the I. A. O. S., in imparting technical instruction to farmers in the most up-to-date scientific methods of agriculture. The Irish Agricultural Department was created in 1899 and Sir Horace Plunkett was appointed its Vice-President. He held this office till 1907, and thus was for nearly eight years practically the head of the Department. In this way while the Agricultural Department assisted the farmer to 'better farming' the I. A. O. S. organized him for 'better business'; and 'better living' is, in Sir Horace Plunkett's own words, largely the result and fruition of these two other things.

At the end of June 1913, there were 947 I. A. O. S. Societies made up as follows:—

Kind of Society	No. of Societies	Membership	Turn over in £.
Dairy Societies ...	329	46,956	2,464,223
Auxiliary Societies (not separately registered) ...	87	...	...
Agricultural Societies ...	175	18,846	157,755
Credit Societies ...	234	20,044	58,244
Poultry Societies ...	18	5,277	64,513
Home Industries Societies ...	19	1,326	4,111
Miscellaneous (including Bacon curing and Bee keepers) ...	25	8,309	104,415
Pig and cattle supply Societies ...	49	1,533	...
Flax Societies ...	9	339	2,918
Federations ...	2	362	349,008
Total ...	947	102,992	3,205,186

As an instance of the benefits conferred by the I. A. O. S., let us take butter—the chief product of the Irish farm. We find that the sales of butter of the various societies affiliated to the I. A. O. S., have mounted up in twenty years from £4,363 to £1,897,630.

The two federations created and controlled by the Irish Co-operative Societies are, the Irish Co-operative Agency Society limited for the sale of agricultural co-operative productions to retailers, and the Irish Agricultural Wholesale Society for the supply of agricultural requirements to Agricultural Co-operative Societies. Though recently formed they show a steady increase of business and carry on the trading operations, while the I. A. O. S. carries on the work of organization. A devolution scheme in connection with the general movement is being carried out, by establishing depôts

at places like Sligo, or Limerick so that a shipload of agricultural necessities for instance can be imported at any of these places and distributed thence at less cost than if the same goods were sent from Dublin to their various destinations. These depôts are under the control of District Advisory Boards.

As the members of the general committee of the society are scattered all over the island, its powers are delegated to the Executive Committee consisting of over thirty members elected by the general body. General meetings of members of the Society are held to discuss important questions of policy and to elect the sub-committees. There are Provincial (District) sub-committees for different centres, to deal with local matters. They supervise all organizing work in their respective provinces, make recommendations to the committee of management and hold provincial conferences to elicit local opinion on questions affecting the movement. Sir Horace Plunkett has all along been the President of the I. A. O. S.

The Society is supported by donations, subscriptions and fees from constituent societies. When the department of agriculture was created it subsidised the I. A. O. S. but since Sir Horace Plunkett's retirement from the Department the subsidy has been gradually withdrawn. After 1913, the Society received liberal grants from the Development Commissioners appointed by Parliament to conduct an enquiry into the conditions of agricultural and other industries and to recommend loans and grants. The income from affiliation fees and subscriptions from the constituent societies is, however, growing and it may be expected that the trading societies will in the future wholly support the parent Society.

In 1908, a movement was set on foot to present a testimonial to Sir Horace Plunkett. The amount raised was, however, at his request devoted to the founding of the Plunkett House in Dublin which serves as the head-quarters of the Society. The Society publishes a weekly paper "The Irish Homestead."

An interesting offshoot of the I. A. O. S. is the organization called the United Irish Women; and according to the well-known writer and poet Mr. G. W. Russell "the best augury of the future of the country life movement in Ireland is the friendly comradeship of these organizations of men and women, is bringing their own special faculties and qualities to the work of building up a rural civilization." The 'United Irish Women' is the organ of this latter body.

The work of the I. A. O. S. has transformed a great deal the country side of Ireland. It has not only saved the butter industry but it has made the people habituated to the thought of common action for the common good. Emigration has been checked. Self realisation has come to the humblest. A truly democratic spirit has been created. In place of miserable hovels are to be seen rows of pleasant cottages. In short here, as elsewhere, the co-operative societies have become the centres of educational light and have created 'ambitions exhibiting keenness for progress.'

The Progress of the Co-operative movement in Ireland has a lesson for our countrymen. When so much has been achieved there by means of co-operation, Indian co-operators have every cause to be hopeful. But in spite of the advance made so far we still stand badly in need of a Plunkett to whom shall be revealed the vision of a prosperous and contended country side and who will make it his life-work to introduce "better farming, better business and better living" by organizing the Indian farmer.

THE VALUE OF ECONOMIC STATISTICS IN INDIA.*

BY GILBERT SLATER, M.A., D.SC.

THE search for knowledge is carried on under the influence of various motives. So far as economic knowledge is concerned I notice three main objects with which it is pursued both in India and elsewhere. There is one class of enquirers who search for economic information with the idea that sticks are required to beat dogs with. These are the controversialists, who want to get hold of facts, or reputed facts, in order to make a point for or against the Government. With these I have at present nothing to do. There is a second class of enquirers who are animated by a scientific spirit, by a love of truth for its own sake, irrespective of any use which may be made of it. With these also I have at present nothing to do. I assume that you who are here present belong to a third class of enquirers, those who desire to acquire economic truth because of its value as a guide to action.

The gathering of statistics is an important part of the pursuit of economic truth. Assuming therefore that you belong to the third class of enquirers, the manner in which you will initiate statistical enquiries will depend upon the sort of use to which you mean to put the knowledge when obtained.

The gathering of statistics may be, to a certain extent, the work of private individuals; but the powers of individuals in this respect are very limited, especially in India. We have no Indian statisticians who have done work on anything like the scale of the investigations of Mr. Charles Booth and Mr. Seebohm Rowntree. It is true that we have had very creditable efforts in these directions, but the conditions in India are such that the amount of investigation so carried on has necessarily been small. Hence statistical enquiry becomes a function of Government. It follows therefore that the policy which we should advocate with regard to the State collection of statistics depends upon the general policy which we advocate with regard to the relations between the State and the economic life of the country.

You are all no doubt familiar with the *laissez faire* doctrine, the adherents of which look upon almost any form of State intervention in the economic life of the people with a sort of holy horror. This doctrine partakes rather of the nature of a religious dogma than of a scientific theory. It originated in France, being a deduction from the doctrine of pre-established harmony, a theory with regard to the ultimate facts of the Universe which was at the time very fashionable but which has few if any advocates at the present day. It was transported to England by Adam Smith, with results somewhat similar to those of the transportation of the comparatively harmless rabbit of the British Isles into Australia, where it found a congenial environment and grew and multiplied into a serious pest. There were many reasons why the *laissez faire* doctrine found a congenial home in England in the end of the eighteenth and first half of the nineteenth century. There was very rapid transformation of industrial conditions, and the active business men who were equipping English Industries with new machinery, and revolutionising business methods, and making great fortunes for themselves in the process, objected very strongly to being interfered with by any Governmental regulation, whether based on ancient law and customs, or prompted by concern for the labourer who was frequently exploited and oppressed, or for the consumer who was frequently swindled by adulterated goods. Many professed economists, as for example, Nassau Senior, made themselves spokesmen

* A Lecture delivered at Mysore.

of the capitalist class. In the second place, the character of the administrative machinery was such as to cause the ordinary man who had no special interests to serve, to look with distrust upon any Governmental activity that could possibly be avoided. The reason of this was that Government officers were recruited by political nomination, and controlled by the party system. Hence a a man with two sons and some political influence might secure a Government office for one son who was lazy and stupid and entirely lacking in initiative and self-reliance, he would allow another son who was able and industrious to go into private business in which his talents would have freer scope.

There was in fact a system of selection of the most incompetent for the Government offices, and it is no wonder therefore that the friends and relatives of Governmental officials became steady believers in the doctrine of *laissez faire.* We have got rid of that bad system but the inference drawn from it persists.

Ultimately the doctrine of *laissez faire* was transported to India; notably by Lord Morley, who more or less suppressed the Madras Department of Industries, and caused the retirement of one of our men of genius, Mr. Alfred Chatterton, a fact of which you are all very well aware since Madras's loss was Mysore's gain. It is said that good Americans when they die go to Paris; I note that English economic fallacies when they are found out in England, come to India, and though a theory may be dead buried there, its ghost may start a fresh career of mischief here. So it was with the doctrine of *laissez faire.*

Fortunately this doctrine did not, in coming out to India, find a congenial environment. The attitude of the Indian mind, if we can draw inferences from certain customs surviving from ancient times, has always been of an opposite tendency. Here at Dasara we are reminded that one of the ancient duties of an Indian Raja or Maharaja has from time immemorial been to be decorated with great abundance and variety of jewels. It would be a great mistake to suppose that the object of this is the personal gratification of the Raja himself, or of the ladies of his household. We know, through the investigations of Sir J. G. Frazer and through other sources, that precious stones, and also gold and silver, have magical properties, each variety conferring upon the wearer its special benefit and advantage, such as health, strength, immunity to some disease, good fortune, and the like. The Raja acquires these advantages. But the Raja himself is a magical representative of the whole State and the community over which he reigns. Therefore all these desirable attributes which are bestowed by the jewels upon the Raja are also bestowed upon the people. There can therefore be little doubt that the ancient Hindu belief is that it is a business of the Government to do anything whatsoever that may appear to be likely to further the economic well-being of the people. Nor do I see any change in the present day attitude of the Indian mind. If anything I should say that Indian thinkers are apt to go too far in their repudiation of the exaggerated doctrine of *laissez faire* as it was current some sixty or seventy years ago in England, the truth it appears to me is in these questions somewhere in the middle. I think we can safely concede to the advocates of the *laissez faire* doctrine that the burden of proof rests upon those who advocate any particular intervention of the State. The State should leave well alone; and even when things are not altogether well, if there is a good hope that an effective remedy can be found by the voluntary exertions of individuals and associations, it is better for the State to confine itself to removing any unnecessary obstacles that may obstruct such voluntary action, rather than take on the work itself. But as soon as a careful review of the situation

shows that there is some evil to be remedied, or some danger to be averted, or some benefit to be gained, and the necessary action is beyond what reasonably can be expected from voluntary exertions, then it is the duty of the State, since it is the one organization that exists for promoting the common interests in any direction whatsoever, to take the burden upon its own shoulders. If it fails to do so, it proves itself an incompetent or negligent trustee of the common well-being.

In the old days Indian princes did not, as a rule, show great activity in the collection of statistics, though the greatest of all, the Emperor Akbar, was an exception. Under stationary economic conditions this neglect was natural; and it has so long been the custom that the ordinary Indian agriculturist or business man is likely to misunderstand enquiries into what he regards as his private business. He is apt to regard them as probably a preliminary to some new form of taxation, and to frame his answers accordingly. But, however, the case might be when life went on unaltered from generation to generation, with the exception of occasional calamities like famine, pestilence, or invasion; the case is very different during our own time. Great inventions are rapidly transforming methods of manufacture and transport; India is linked up with all the world by lines of steamers and is traversed in all directions by lines of railways; produce is easily transported into the country and away from the country; hand spinning is practically extinct; handloom weaving is faced with the competition of the Bombay Mills as well as those of Lancashire. Innumerable opportunities for Industrial progress are presented; but on the other hand there is danger that those countries and peoples which fail to avail themselves of the new opportunities will sink into greater poverty than before. Hence there is a necessity for this State, and for other Indian States, to take stock of their resources; to ascertain what mineral resources lie latent and capable of profitable development beneath the soil; what water-power can be utilised; what further agricultural progress can be achieved; for what industries the conditions of success are here present; and to what extent and under what conditions industrial progress is being achieved, whether purely by the efforts of the people themselves or through the active help and encouragement of the Government. In making such enquiries it is to be borne in mind that the economic condition of any State of India is not necessarily satisfactory when the existing resources and income are sufficient for the people. In India the birth rate is very high; how high, nobody knows, but certainly a great deal higher than it is declared to be in the official statements on the subject. The death rate also is very high, but not so high as to preclude a great annual increase of population in every year which is not marked by some special calamity. The movement in the direction of learning the secrets of diseases for the purpose of combating them is one of the most vigorous of our time. All civilised nations in times of peace, have been rapidly reducing their death rates; progressive India will naturally do the same. But the conditions which determine the birth rate are deeply fixed in customs and religious beliefs founded upon natural instincts, and therefore we can hardly anticipate any reduction in the Indian birth rate corresponding to the possible reduction in the death rate for a very considerable period of time. It is therefore necessary, not merely to enquire whether the present resources are sufficient for the present population, but whether a continual advance in the production of the necessities of life can be secured keeping pace with a continual increase in the population.

We want, therefore, what may be termed a statistical survey relating to industrial progress; and this is the line on which the collection of economic statistics of the State of Mysore has been developed. Recent

events remind us that there is another purpose for which it is equally necessary that the rulers of the State should have the fullest possible information about the economic condition of the people. There has been a considerable failure of the rains ordinarily coming with the south-west monsoon; there is a great deal of anxiety as to what rain may be forthcoming during the period of the north-east monsoon. It is the aim and business of Government in such circumstances to avert economic disaster from the people. There are things it can do; it can prohibit the export of grains; it can take special steps to secure import; it can fix prices; it can commandeer stocks. In order to know what it ought to do, to know, for example, if it fixes prices, what prices should be fixed, it requires accurate information, as, for instance, with regard to the quantity of stocks in the country, the amounts that may be available outside, and the necessary consumption of the people. The more full and accurate the information which the State has been in the habit of collecting in normal times, the easier it is for it to gather the needed information, without uncertainty or blunder, in a time of special emergency.

I do not think that I need elaborate my contentions that an active economic policy is the duty of the State, that such a policy should be guided by accurate knowledge, and that the knowledge must be gathered largely in a statistical form. But I should like to utter two warnings. The first is that in statistics quality is of great deal more importance than quantity. You can gather together statistical information on a vast scale, and then hand the facts and figures collected to a body of experts who will collate them and draw the inferences from them which they are capable of yielding; and then you can have economic experts to advise on policy which the results indicate as advisable. But the whole of this work is vitiated if the clerks or village officials, who in the first place gather the information, fail to put down what is actually the fact. It appears to me that in India it generally happens that the first collector of statistical information has very little appreciation of the object for which the statistics are required and very little conscientiousness in the matter of accuracy. Just as the Indian servant of an European master is reported to have said, "What master wanting, that only I saying," so the local subordinate official appears to me to take up the attitude "The Sarkar wants figures; I must give the Sarkar figures. What figures is Sarkar wanting? I will put down the figures that will give the Sarkar the greatest satisfaction." I could give you an example from my personal experience. I was once staying at the house of a principal of a college in India. He received forms from the Government asking for the various items of information with regard to the College, one being the question, 'how many students were living in hostels inspected and controlled by the College.' He handed over those forms to his chief clerk. The chief clerk being a highly respectable and trusted official, filled up the forms and handed them over to the Principal. My friend looked them through and found, I think it was 537 students stated to be living in hostels controlled by the College. He remonstrated with the clerk and pointed out there were no such students and no such hostels, and asked the clerk how he came to make such a gross mistake. The clerk explained that he thought the Government would not be pleased if they found the number O against this particular query; he thought that the Government would like to see a nice big number, and so he put down a nice big figure accordingly.

I am inclined to think that this weakness is very widely prevalent. Whether it is the case in Mysore, I have no special information. But with regard to a neighbouring State, the State of Hyderabad, I have noticed that the census figures regularly show more husbands than wives living at the time when

the census is taken, by a good many thousands. Now Hyderabad is a Mahomedan State; there are, therefore, a certain number of husbands who have more than one wife; but I have never heard that any section of the population of Hyderabad practises polyandry, the custom which would allow one wife to have more than one husband at the same time. Hence I am convinced that the State of Hyderabad has really more wives than husbands and when the census report declares, that it has more husbands than wives I am convinced that the census report is not to be trusted. If the census report is not to be trusted we do not even know how many people we have in India. Still less do we know at what rate people are being born and dying. Just this time last year I was engaged in an examination of the registration of births in the City of Kumbakonam, and I made some cursory examination of the way in which statistics of births and deaths are collected for India generally. I came to the conclusion that the actual births and deaths are grossly understated. But whether it is 20 per cent, or 25 per cent, or 30 per cent, or more of the actual births and deaths that fail to be registered I cannot tell you. Probably the deficit is in the neighbourhood of 25 per cent and when, we come to the statistics of the causes of deaths we are very far indeed from attaining even such poor approach to accuracy as has been realised in the registration of births and deaths. Now if the most elementary vital statistics are so badly collected that any inference drawn from them is liable to be entirely misleading, you can well understand that there may be far greater inaccuracy in the more complicated economic statistics which the State of Mysore is collecting. I would, therefore, urge efforts in the direction of instilling a conscientious regard for accuracy into students in the Colleges and boys in the High Schools from which recruits to the Government services may be obtained. I might, of course, expand on this point, and may draw your attention to the general need for instilling reverence for the broad ideal of conscientiousness in all work undertaken throughout the ranks of all who come within your system of education.

Another warning I would like to utter is that you should not, in your search for economic truth, whether by statistical enquiry or otherwise, put too narrow an interpretation upon the word 'economic.' Everything that relates to ordinary human life is to some extent within the scope of economic Science, nor can any hard and fast rule be drawn between economic and non economic aspects of life. Recently, Lord Ronaldshay drew attention to certain alarming assertions with regard to the prevalence of hook-worm in Bengal. This perhaps you will regard as more a medical than an economic question. But, as matter of fact, prevalence of hook-worm is a very important economic fact, not only because the vigour and vitality of the population is one of the most important factors in wealth production, but also because of production of wealth itself is only a means to an end, that end being the maintenance and advance of human life, physically, mentally and morally to as high a plane as can be reached. There has been a time in India when economic enquiry was too much neglected; to-day the importance of the study of economics is generally recognised, and the presence of a certain number of University Professors of Economics in India is a sign of that recognition. It is now, therefore, I think, becoming necessary for a Professor of Economics not only to draw people's attention to the importance of the subject which he professes, but also to warn them against what has been termed "the obsession of Economics" and to remind them that life itself is something higher than the mere means of living.

THE FOREST PRODUCTS LABORATORIES.

BY A. G. MCINTYRE, B.A., B.Sc.,

Superintendent, Forest Products Laboratories, Canada.

THE prime object of forestry is to manage the forests and their products so as to reproduce them and to use them as efficiently and economically as possible. For this purpose provision is being made within the jurisdiction of the Department of the Interior for the protection of the forests from fire, for eliminating waste in lumbering operations and for educating public opinion to co-operate in these objects. To completely fulfil the objects of forestry it is necessary to go further and investigate the possibilities of conserving the forests by reducing waste in manufacture, by prolonging the life of forest products used in construction, and by developing uses for products now wasted for lack of knowledge as to how they may be employed. Forest services in older countries have felt the necessity finally of undertaking scientific investigations of such matters. Such work has been carried on in Germany, and other European countries, in the United States, and in some of the British dominions, and where it has been undertaken it has appealed strongly to those engaged in manufacturing, who have given it every assistance and even material support. A laboratory and investigation staff was established four years ago by the United States Forest Service at Madison, Wisconsin, in co-operation with the University of Wisconsin, for investigations of this nature, and the work has appealed strongly to the manufacturers, who have given it every encouragement.

WASTES IN WOOD MANUFACTURE.

An analytical study of the modern logging camp and saw-mill shows :—

1. That 25 per cent of the volume of all trees cut is left on the ground in the form of "cull" logs, tops, and stumps. This material checks natural reproduction, increases greatly the danger of fire, and retards the clearing of the land for agricultural purposes when it is suitable for such purposes.

2. That many trees, especially of certain species, are left because it is thought they do not furnish wood suitable for the needs of commerce. Until comparatively recently in the United States red gum was considered worthless because it could not be seasoned without serious warping and checking. Tupelo gum was ignored for the same reasons. Western larch, western hemlock, and loblolly pine were not used because they were not as strong and durable as longleaf pine, and in the southern states could not be sold because it was thought they were not as good as the hardwoods of the Ohio valley. Such cases are rapidly becoming fewer in number, but even yet the forests in all parts of Canada, as well as the United States, contain splendid trees that are left to the fires and winds, ostracized from the woods of commerce, because in the stress of business competition no one has time to determine whether or not it is practicable to use them as well as the species that are better known.

3. That after the sawlogs reach the mill, fifty per cent of their volume is wasted in the form of bark, slabs, sawdust, edgings and trimmings. Some of this waste is used for fuel, but in most cases the larger part of it is destroyed in burners or thrown away.

We also discover, if the analysis is carried further, that after wood is put into service its period of usefulness is greatly diminished because it is not properly protected against organisms which destroy it, such as decay-producing fungi, insects and marine borers.

Lumbermen and owners of stumpage have grown so accustomed to regarding these wastes as necessary that they are frequently

impatient with the man who calls their attention to them, and who predicts that the time will come, as it has with the steel and packing industries, when the present so-called wastes will be turned into sources of profit.

ECONOMIES IN UTILIZING WOOD.

Wood is a fibrous material, the fibres of which are composed of cellulose and lignin. When the fibres are separated, they are valuable for the manufacture of paper, fibre-board, and other fibrous materials. It has also been demonstrated tbat cellulose can be converted into fermentable sugars, from which alcohol can be made. Wood alcohol, pyroligneous acid, acetate of lime, artificial silk, and many other products have been manufactured from cellulose. If methods can be perfected so that these processes may be applied witb profit to mill and forest wastes the economic importance of this development will be stupendous:

1. It will increase the value of forest lands to the point where it may be profitable to the Government or individual to grow lumber.

2. It will decrease greatly the cost of clearing agricultural lands.

3. It will change methods of logging, in that slash, tops, "cull" logs, etc., will be brought from the woods, thus lessening the fire risk and leaving the ground in better shape for natural reproduction.

4. Instead of a saw-mill only, there will be a group of plants in wbich wood will be converted not only into lumber, but into alcohol, paper, and other staples of commerce. From it in some cases would also be secured turpentine, rosin, and other valuable oils and gums.

The movement for forest conservation depends more upon the ability of science to demonstrate the potential value of wood substance now wasted than upon any other factor. If this can be done, the solution of other phases of this great problem will follow as a natural sequence. To do this, or to aid others in doing it, is the purpose of the new Forest Products Laboratories.

PURPOSE AND WORK OF THE LABORATORIES.

The Forest Products Laboratories are laboratories of practical research, conducted by the Forestry Branch of the Department of the Interior in co-operation with McGill University. The purpose of the laboratory is:—

1. To secure authoritative information on the characteristic mechanical and physical properties of commercial woods and products secured from them.

2. To study and develop the fundamental principles underlying the preservative treatment of wood, and its use for the production of fibre products.

3. To develop practical ways and means of using wood which, under present conditions, is being wasted.

4. To serve as a public bureau of information on the properties and utilization of forest products.

5. To Co-operate with consumers of forest products in improving present methods of use.

The work carried on at the Forest Products Laboratories leads to a better utilization of our forest recources, *viz*:—

1st. Finding more efficient methods of manufacture of woods.

2nd. The elimination or utilization of the wastes of manufacturing and logging.

3rd. Finding use for woods not now commercially useful, from a study of their mechanical and physical properties.

4th. Finding better use for woods now used to make the lower-grade commodities.

5th. Looking for Canadian woods to substitute for imported woods

either in their natural state or after treatment.

6th. Studying and developing the fundamental principles underlying the treatment of wood in its use in the manufacture of fibre products—alcohol, turpentine, resin, tar, etc.

7th. Serving as a public bureau of information on the properties and utilization of forest products.

8th. Co-operating with consumers of forest products, in improving present methods of use and formulating specifications and grading rules for commercial woods, materials secured from them (such as gums, oils, resin, etc.), and materials used in the treatment of wood (creosote, zinc chloride and other preservatives).

The work of the Forest Products Laboratories will be divided into the following sub-divisions :—

1st.—Timber physics.

2nd.—Tests of the mechanical properties of timber.

3rd.—Pulp and paper.

4th.—Wood preservation.

5th.—Wood distillation.

6th.—Chemistry of woods and wood products.

7th.—Pathology and agencies destructive to wood.

It is proposed to develop the work of the laboratory in units, commencing first with timber physics, timber tests and pulp and paper.

The United States Forest Service has a fully equipped laboratory at Madison, Wis., which employs eighty people and spends annually in operating expenses $ 125,000. It has been organized for four years and already at least half a dozen companies with individual capitalizations up in the millions are operating, or building to operate, on the results of the investigations carried on at that laboratory. The benefits and results are striking and immediate. The fields of investigation in all the departments are very broad and in many cases only partially developed. The general purpose of the Forestry Branch Laboratories will be to adapt information and data already obtained elsewhere to Canadian materials and conditions and to further investigate problems and projects which directly affect Canadian interests.

The following summary of the kinds of work conducted at the laboratories will give a fairly comprehensive idea of its field of work.

PHYSICAL CHARACTERISTICS OF WOOD.

The physical properties of the woods studied will be specific gravity, shrinkage, microscopic structure, and, in the case of some species, specific heat and heat conductivity. Data secured from investigations of this class are chiefly used in correlating the results of other experiments.

A study of the physical properties and characteristics of Canadian woods is most important and fundamental to any advance that can be made in the investigation of the uses of wood. A knowledge of this is necessary for all the other work of the loboratories. This department will operate in comparing the properties of Canadian woods with those of other countries, and determining accurately and completely their physical characteristics. The work will include the making of photo-micrographs of all Canadian woods and the study of the variation in properties due to variation in natural conditions. In this section will be included the important work of wood conditioning, dry-kiln and air-dry problems.

MECHANICAL PROPERTIES.

Industries seeking new woods for their raw material must have accurate knowledge

of the mechanical properties, such as strength, resistance to shock, bending, elasticity, checking, shrinkage in drying, etc. It is proposed to carry on this work in exact accordance with the United States Forest Products Laboratory methods, so that all the Canadian species tested will be directly and accurately comparable with all the American woods. This will enable users of the laboratories to investigate intelligently the possibilities of Canadian woods. There is a keen discussion among builders as to the various merits of different woods for their various purposes. It will be the duty of this section to place all woods on a comparable basis, so that their relative merits may be equally discovered. The tests will be made on small clear specimens free from defects, on structural timbers in their manufactured forms, such as spokes, axles, etc. Tests are also made to determine the effect of methods of seasoning, preserving and fire-proofing on the mechanical properties. The general purpose of work of this character is to furnish engineers and architects with data upon which to base moduli for design and upon which to base material specifications, to permit manufacturers using wood to judge the desirability of substituting other woods for those becoming scarce, and to determine how wood can be seasoned and treated with the least injury to its strength. The actual tests will be made by breaking the specimens under examination and determining the loads which they will carry or the shocks which they will stand. The wood will be subject to bending, twisting, compression, shock and moisture, the effects of each being noted and the aggregate results determining the value of the wood for any specific purpose. The equipment used will be very similar to that by which steel is tested and which is now considered essential to all design and use of steel.

PULP AND PAPER INDUSTRIES.

The pulp and paper work of the laboratory comprises the study of the uses of different species and forms of wood for the production of pulp and paper products.

The chief purposes of the work are to determine the value, for the production of pulp, of woods not being used at present, and to conduct experiments for the purpose of perfecting present methods of manufacturing wood-pulp. Especial attention will be given in this work to the development of methods of manufacturing a commercial pulp from woods at present being wasted.

This is one of Canada's largest and most rapidly expanding industries. This country has trebled its production of paper in the last three years. Very few woods are used in the manufacture of paper. The United States laboratory at Madison, Wis., is adapting processes for using other commercial woods in special kinds of papers. There are in this country many species which might be found suitable for the manufacture of pulp. Last year over half Canada's pulp-wood was exported to the United States, instead of being manufactured in this country. Better methods and less waste will enable Canada to be the leading pulp and paper country in the world. No agency is so well adapted to use in the development of this industry as the Forest Products Laboratories. The Canadian Pulp and Paper Association heartily endorsed this laboratory, so that this section is assured of the unanimous support of the manufacturers whom it will benefit. The equipment provided in the estimates will be complete, and will place this laboratory on a commercial basis, so that the results obtained will be directly applicable to mill work. It will include a small-sized paper machine identical with machines used in modern mill practice, two digesters—one for sulphite pulp and one for soda pulp—computing equipment, screens and all the necessary equipment for the commercial manufacture of paper. All machines will be adjustable to make any combinations necessary for a thorough investigation of all the

variables entering into paper manufacture. The paper machine itself will be capable of manufacturing all grades of paper, including wrapping, writing, news, kraft, board, etc.

It is found in the United States Laboratory that the pulp and paper section alone has justified the existence of the laboratory many times over. The former director of the laboratory is now with a private corporation in Southern Florida erecting a large plant to manufacture long leaf pine into paper, being the result of investigations which he carried on at Madison. There is also at Cornell, Wis., a $3,000,000 mill manufacturing steamed ground-wood board from jack pine, the result of investigations conducted on the steaming of wood by this laboratory. Canada offers enormous opportunities for such investigations to bring immediate and far-reaching results.

The special problems that this section will deal with at present are: (1) methods of making ground-wood pulp to determine whether or not commercial pulp can be made from species other than spruce; (2) the practicability of treating different woods with the sulphite and soda processes; (3) the qualities of paper which can be made from different grades of the various sulphite, soda and ground-wood fibres; and (4) the practicability of using different forms of wood waste for the manufacture of paper pulp and other fibre products. The manufacture of wood-pulp and paper is to be one of the largest industries in Canada and the problems that affect them are of vital interest to the country.

Artificial Drying of Wood.

This class of work includes the study of commercial dry-kilns and their operations; also the experimental study of different methods of drying wood. The proper seasoning of wood is a very important factor in its use and one which is at present too frequently neglected.

Agencies Destructive to Wood.

The office of Forest Pathology will be located at the laboratory for the purpose of studying wood-destroying fungi and how they are affected by various wood preservatives. The chief purpose of this work is to suggest ways and means of perfecting the preservative treatment of wood.

Wood Preservation.

This division of work includes all problems dealing with the impregnation of wood with preservatives, fire-proofing substances and other materials. At present its attention is largely directed to the study of preservatives and preserving processes. Wood preservation concerns principally the railways, mines and other large consumers of structural timbers, but it also is of much interest to the building trades and to municipalities interested in wood as paying material.

These problems may be broadly classified into:

(a) Those dealing with the preservatives themselves;

(b) Those dealing with the methods of getting the preservatives into the woods.

To study the first class of problems, this laboratory will be provided with a fungus pit, which will contain chambers thoroughly inoculated with various wood-destroying fungi.

The humidity and temperature of the pit is so regulated that conditions in it are most favourable to the growth of fungi. Wood will be treated with different preservatives and placed in the pit. The efficiency of the preservative will be determined by its ability to resist the fungi.

In addition to such laboratory experiments, timbers will be treated and placed in actual service and will be carefully inspected at periodic intervals.

The second class of problems are primarily problems of mechanical engineering, dealing

with the methods of forcing the required amounts of various preservatives into the different species and forms of wood.

WOOD DISTILLATION.

This line of activity is directed to the study of methods of distilling wood and methods of refining and grading the products secured. Work will also be done to demonstrate the practicability of using certain of the products for different purposes, thus creating a market for them. This work bears directly on the possibility of using the enormous quantities of mill and forest waste. The work of this section naturally divides itself into :

(*a*) Experiments to determine what products and how much of them can be secured from different woods.

(*b*) The design and operation of machinery best adapted to the production of these products having the greatest value.

(*c*) Refining of the crude products.

CHEMICAL CHARACTERISTICS AND PROPERTIES OF WOOD.

This work consists of experiments to determine the quantity and quality of essential oils, tanins, gums, and other products which may be secured from different woods. It bears directly on the practicability of using certain forms of forest waste.

The work of the section of chemistry is largely supplemental to the work of the other laboratories. Its purposes are :

(*a*) To find uses for products at present having little or no commercial value.

(*b*) To secure data upon which to base commercial specifications for wood products, wood preservatives, and other products secured from or used in the treatment of wood, and to investigate chemical problems that come up in connection with the work of the other sections.

PUBLICATION OF RESULTS.

As perhaps the chief purpose of the Forest Products Laboratories is to serve as a public bureau of information in the field of work which it covers, when problems of general interest confront commercial organizations the Forestry Branch will co-operate with these organizations in their solution, supplying the skilled supervision of the work and retaining only the right to publish the results.

The possible value of the Forest Products Laboratories to the lumbering and wood-using industries will be readily recognized by all who are familiar with the problems confronting these industries. The actual value of the laboratories, however, depends upon its ability to obtain results capable of practical application. To secure such results to the fullest extent it must have the support and co-operation of the men who are in constant and intimate association with commercial problems. The Branch, therefore, invites such men to share with it the responsibility of making the Forest Products Laboratories play an important and useful part in reclaiming the wastes of the forests and in increasing efficiency in the commercial uses of wood.

At the conclusion of the review the Lieutenant-Governor summarises the progress of the co-operative movement in the province for the past quinquennium, which he regards as a potent lever for the uplift of the rural population and which, he observes, he has followed with the keenest interest. After reciting facts and figures illustrating the advance made he expresses confidence that the movement which is achieving so much for the welface of the rural community will continue to receive every legitimate assistance in the further expansion that is now taking place.

TRAINING THE BOY FOR INDUSTRY.*

By Louis L. Park,

Superintendent of Welfare, American Locomotive Co.

TO a large percentage of boys who each year reach legal working age the call to enter industry comes with a strong appeal, the appeal of a great new experience. It offers a change from the routine of a school life and a freedom from study; it offers the charm of an income and of more spending money, a feeling of an independance and an improved standing among one's neighbours. Others have succeeded, have secured good jobs and earn good wages: why may not they? It is the call to a big adventure in which are wrapped the possibilities of the future. Were we to ask these boys what is the most important thing to be attained through Industry, it is likely that from most of them we would receive the answer "Good wages."......But Industry holds more for these boys than a chance for financial gain: it gives to many the opportunity for that development of mind and body which leads to broader interest and to increased ability, and their activity in matters of social interest is partly the result of success as Industrial Workers. The larger relationships of Industrial life present also the problems of moral development, either for better or for worse, for with the Associations which come with work in mill or shop come moral influences which help for the strengthening of character or which tend to lower the standards.... ..If the boy who is to enter industry is to be prepared for life, much will depend, then, upon how he is prepared for Industry and the extent to which our schools prepared the boy for Industry will in many cases mark the extent of their influence in shaping him for life i a Democracy.

NO SIMPLE RULES APPLICABLE.

The vocational training of boys for indus try can be considered here in a very genera way only. So varied are the demands o industry, so many the degrees of opportunit offered and so different the provisions mad for training after employment, that no simpl rule can be suggested. The needs of eacl locality will naturally govern to some exten the vocational training advisable, and th preparations which the employer makes wil modify those needed in the school for th training of the future worker. Still further there is the furthur prohlem of adjusting th individual to his proper task, of finding th work which will afford development an provide income to the satisfaction of th worker. These variables must be met by a programme sufficiently flexible to ensur justice to the greatest possible number.

We may well keep iu view the fact tha most industrial workers eventually specia lise in their work, no matter how elaborat their training. The young man finds tha he does his best work and makes the bes wages in some one process, and to thi he is apt to hold, while only a few engag in work involving broad training an demanding general skill. The instructio given to employees after entering industr is, therefore, part of a programme of adjust ment which is necessary to enable th worker to find his ultimate job.

AIM AT MENTAL DEVELOPMENT.

All specialisation is most intelligent an appropriate if it has been preceded by a programme of training in different opera tions. The apprenticeships and othe training courses offered by employers hav this as one of their objectives, not onl to develop men for general utility, but t give the mental development which pro duces efficiency in the worker. Severa things are here accomplished: First, Th worker's curiosity as to certain kinds o

* With acknowledgments to the *Vocational Summary*.

work is satisfied in the process of rotation about the shop and he is content afterward to settle down to one of them; if confined to one task from the start he is apt to think some other is more attractive and keep changing later to a less advantage. Second. He is better able to judge the work to which he is adapted, because of his all-around experience. Third. He is mentally broader and more ingenious and self-reliant from his contact with many problems and their solution and his mastery of a number of processes. Fourth. He has less fear of specialisation, since he knows his ability to do other things, if necessary, and there is absent a feeling of narrowness due to the confining character of his task. If variety of opportunity is not provided it will, in many cases, be obtained by voluntary drifting, and it may well be given by plan at first than by accident later.

Whatever the school may do in vocational guidance should help to decrease, though not eliminate, this post-employment fitting of boys to jobs and jobs to boys. The thing he likes best may eventually be set aside and another more serious task may claim his life's greatest effort, but with the larger number the guidance of the school will prove to be safe and, in many cases, final.

When a modern training course if offered by an industrial concern, the matter of preliminary training is simpler.......When proper training in industry is not provided, the vocational opportunity of the schools is apparent. To a greater or less extent they may prepare for specific positions or trades and give the student the breadth of experience which should always precede the specialisation. They may at least teach the essential operations of certain predominant trades, or what we may call the "alphabet" of the trades, from which are derived the many combinations which make up a variety of Industrial occupations. With these fundamentals mastered it will be easier for the student to adapt himself to a specific situation than if he has attempted to specialise in school and must later take up other work.

MENTAL TRAITS THAT HELP.

But whatever may be the extent of trade or vocational tra ining before the boy enters the shop or mill, there are certain mental traits which, if he has acquired, will help toward successful progress in industry. He may have gone through the school programme and done all the stunts required and be able to show some samples of his productive ability, but yet miss the most desirable of things possible of accomplishment. The state of mind is, after all, one of the great things desired—the attitude of the boy toward his future work. His conception of the scope of his school training, his ability to adjust himself to his work, his reaction under discipline, his sense of the relation of quality and quantity, and his attitude toward compensation will have much to do with his progress toward efficiency. The extent to which the school may help in shaping his attitude toward these is problematical, but whatever it may be able to accomplish in this direction will be desirable. We have known boys to consider their school trade training as sufficient to ensure a substantial income and who have drifted from place to place because it did not soon materialise. We believe that it is unwise for any one to encourage boys in considering themselves skilled mechanics when they have mastered only the elements of a trade, yet there is a tendency, even though an unconscious one, for this to occur. A realisation that his training has been a preparatory one will usually help the boy to better appreciate the requirements of his real job.

MUST PRODUCE RESULTS.

"Production" is the big word in most industrial establishments. However promising a boy might be, the world and his employer will not long be satisfied with promises; he must produce the goods. The shop was called into being to produce needed

commodities and it must fulfil its mission *efficiently or die.* It is not surprising that upon this word has pivoted the whole of business organization, and by this word must be guaged the extent to which each individual fits into the scheme of Industrial enterprise. Whatever else the boy may be or do or may not do or be he must produce his expected share of the shop's grist. It is "output" or "putout". The proper balance between "quality" and "quantity" is the secret of success in industrial production. A boy may be extremely accurate and painstaking but be exasperatingly slow. Another may be "quick as a wink" but lack the care necessary to proper finish. Each of these will find his niche, but his name should not be "legion", for these niches are limited. The great demand is for those who can co-ordinate carefulness and speed and their number must continue to increase. Both traits can be developed in some degree by training. One naturally expects our schools to teach accuracy rather than speed, but if quick thinking can be stimulated in school work it will pave the way for the final development of the future skilled producer.

MONEY-MAD POLICY TOO PREVALENT.

The money question is a serious one to many young people at the age of business opportunity, particularly at this time of national crises when big wages are available as never before. Too many are willing to sacrifice their futures for immediate financial gain and leave school and further training for what they may now earn. Courses of training in Industry are often passed by for futureless jobs with large incomes attached. Thousands of young men are being ruined to-day by this money-mad policy which has become so prevalent. It is a condition which can be reduced only by the close co-operation of school and parent and employer. It deserves our best thought and the effort in a campaign of education which must begin at some point far from the zone of temptation.

We believe that most schools have a direct moral influence which is of the greatest value in steadying the lives of growing youth. Where home and other agencies co-operate with the school in moral training the results are encouraging, but when the school operates alone the task is a trying one. Within the ranks of Industry will be found some of the finest people the world has produced, men and women of high ideals and excellent influence. But Industry as a whole has not as definite a moral calibre as we might wish; its detailed influence may be for good or for evil; its habit-changing and habit-forming power will sometimes be for the worst as well as sometimes for the better.

Since the problem of preparation deals with an endless variety of student abilities and tendencies it is evident that individual instruction in school will count effectively to whatever extent it is permissible, for that preparation alone can be effective which takes into account the needs of the individual student. Thoroughness in a smaller number of subjects, will outweigh a more pretencious programme hurried through. It is not so much the extent of his knowledge as it is his ability to apply what he has studied that measures the value of his training.

His Majesty's Trade Commissioner in India states that a British Industries Fair, organized by the Board of Trade, will be held in London from February the 24th to March the 7th, 1919, at which about 600 British manufacturers will exhibit glass, earthenware, china, paper, printing, stationery, fancy goods and toys. Representatives from India desirous of securing invitations should apply, upon *arrival in London, to the* Department of Overseas Trade, 73, Basinghall Street, London, E. C. 2

"CAPITAL TO-DAY"—A REVIEW.*

BY THE EDITOR.

A new edition of Herman Cahn's penetrating study of the economic position of the United States of America will be welcomed by all who are acquainted with his original work. Since the first edition was published, the conditions have altered so much in the United States that a fresh edition has been called for for some time. Messrs. Putnams Sons have, we think, done well in issuing the present edition. Besides being well timed, its publication is likely to help to clear the atmosphere of many crude notions and sentimentalities in the region of practical economics, especially in regard to matters affecting credit money, banks and banking and kindred topics usually classed under the general head of "finance." The first edition of the book confined itself to a study of the then existing economic situation in the United States, the essential features of which were developed since the Civil War. The close of the Civil War witnessed in United States "an amazing development," as Mr. Cahn himself puts it, "then undreamt of by Economists and financiers." It consisted of an abnormal increase in the credit money ordinarily created by the Banks, and till then in existence but in moderate volume. This rather unforeseen development made changes inevitable in Mr. Cahn's original work and the result is the second edition now issued. In this a more systematic analysis of the categories of Bank money, of their relations to each other and to social solvency have been attempted by Mr. Cahn.

Mr. Cahn is original in his views and his keen analysis leaves little to be desired. One of his leading ideas cannot perhaps be better described than in his own words. "The seemingly mystic nature of money," he writes, "cannot be cleared up alone, that is, disconnected from the general Economics of the commodity-producing society, especially of its capitalist form. Such a society exists only by the exchange of the products of individuals; therefore value is the foundation of its Economics. The theoretic analysis of value has been the work of the great economist Karl Marx. But, some readers may say, almost every economist has his own theory of value. Such a bewilderment of mind in our own time is tolerated only in that discipline which treats of the material interests of different classes. The investigators in the natural sciences can afford to employ methods and proofs which, consciously or unconsciously, are dictated by a theory of knowledge or human understanding. Are human affairs then the only thing closed to scientific understanding, the only thing in which truth cannot be positively distinguished from untruth, and regarding which there may therefore exist different theories? If the Marxian theory of value can be tested by the rules of science, based on the theory of understanding, then all deviating theories of value are unscientific and false. As a matter of fact the latter have merely the 'marginal utility' of a barrier against the spread of scientific economics." This theme Mr. Cahn develops at length in his book. In fact, as plainly admitted by himself it is this that is mainly responsible for his book. He not only justifies Karl Marx and his method—which according to him was scientific to the last degree—but also claims that he has followed it out successfully himself in writing his book.

It is, we think, unnecessary to criticize Mr. Cahn, for his is the writing of an ardent admirer of Karl Marx and his method, and we would rather like each reader to appreciate how closely he follows his master's opinions and strictures on

* *Capital To-day.* By Herman Cahn. Second Edition. Revised and enlarged. G. P. Putnam's Sons, New York. Price $ 2'00 net

capital and capitalism. The author of *Das Kapital* or rather his writings, may indeed, be said to have inspired Mr. Cahn in writing this book. Mr. Cahn ends his chapter headed "The Mystery of Capitalism," thus: "But there arose a man of such power of analysis and consecutive thinking, as the human race had perhaps not produced in the thousands of years since Aristotle. Even as the archæologists did in Egypt and Assyria, so he dug into the overlaying accumulations which historic necessity had forced men to pile up, uncomprehended by themselves, and thus he laid bare the methods of social evolution. The name of this great man was Karl Marx." To criticise or justify Mr. Cahn is to criticise or justify Karl Marx; Mr. Cahn in his book—which is rather significantly headed *Capital To-day*—brings up-to-date Karl Marx's *Das Kapital* (*Capital*) published originally in 1867. *Das Kapital* has been the Bible of the "scientific" Socialists. Though its prestige has been somewhat shaken by "higher criticism," it is still the source of inspiration for intelligent Socialists the world over. In Marx's hands, Socialism while it gained intellectually, lost morally a great deal. Again, while it became—after Hegel by whom Marx was greatly influenced—more cosmopolitan, it ceased more and more to be the national industrialism of the previous period. Marx did not credit humanity with any goodness and as has been well pointed out ere this put Hegel's dialectic upon a materialistic basis, and made social evolution a matter of material and economic forces. He described his ideal as "nothing else than the material world reflected by the human mind." From this conception of the world, Marx naturally worked out certain fundamental deductions and with these are largely associated his materialistic interpretation of history and especially his analysis of the existing capitalistic stage. He develops, as is well known, the idea that all social changes have their ultimate causes in the modes of production and exchange, or that economic factors dominate all history and determine social organization, classes and class interests. Capital he regards as an "historic concept" and in this opinion stands opposed to labour, which he thinks in this stage, is being exploited to make up capital. He analyses this idea and reaches the conclusion which may be briefly stated in the words that capital—according to him—is nothing but wealth used to exploit labour—capital is dead labour, which the capitalist multiplies to his benefit. When living labour unites with the dead substance of the capitalist not only value is created but also surplus value, and this surplus value, though created by labour, is appropriated by capital. This leads Marx to his other final deduction that all capital is only stolen labour. Mr. Cahn is in the main a faithful student of Marx; he carries Marx's doctrines a stage further and applies them to the conditions obtaining to-day. Hence we presume he calls his book *Capital To-day*. Here are a few passages from his book which illustrate this and his general intellectual indebtedness to Karl Marx:—

"That the laudable zeal of the capitalists to provide mankind with the necessaries of life, and even with luxuries, carries with it its own recompense by enriching them, it would be of course impracticable to deny. The national wealth is in their custody without check and without bond, a condition said to have described by the late lamented President Baer of the Reading Co., a leader of the anthracite trust and Morgan satelite, in a letter to Wilkesbarre minister to 'the Christian men to whom God in His infinite wisdom his given the control of the property interests of the country.' On the other side the wage-workers, as we already had occasion to notice, are practically penniless. Political Economy deals only with wealth, not poverty; the representatives of the latter, therefore, do not count, a fact wittily reflected

George Bernard Shaw in a letter to a w York gentleman who had requested an ointment: 'I shall not be in London that time. In fact nobody stays in idon during the summer, except a few ion cockneys.'"

gain, he says :—

The more labour is ground out of the kers, the less the cost of the product. w then can labour be the source of value? ot saving in the labour cost the same as ing your material cheap? What do we how much of the labour of others is oodied in a product. It is the cost of luction in a product? It is the cost of luction that counts. The capitalist is not rested in measuring his profits by the ker's share, but by the capital invested.

fact is that capital is the controlling al factor; capital, not labour, regulates es. The equation equal labour for equal ur is forgotten; it reads now: for al capital equal profit.

Labour has become wages.

Value has become cost of production.

Surplus product, formerly reserve stock, become profit.

Thus more rubbish has been piled up re labour was buried; its remembrance has vn dim and the mystery is greater than ."

ere is another passage :—

The barons of the middle ages and other booters of the time waylaid the chants and robbed or blackmailed them brutal but straightforward manner. sent day methods are more refined, and underhanded. Neither the former ence nor the present day cheating form imate parts of the respective social ems, feudalism and capitalism, but are rtheless economic factors significant of respective general character of each em.

Altogether the mercantile capitalists ribute their honest share of additional rial to pile on the rubbish heap which eals value and which assumes the proportion of a mound. It appears hardly credible that anything could be buried underneath."

Then, again, take the following which follows shortly after on the same page as the above :—

"In the capitalist system of society any sum of money whatever is *per se* a title to the labour of others, which title, however, can only be realized by that sum being put into the hands of productive or mercantile capitalists for use as capital in the purchase of means of production of commodities respectively.

"The scattered sums of money consisting of the individual hoards of the individual capitalists, of the money of money capitalists, the savings and revenue funds of all classes are collected by these dealers in money, the Banks, and placed by them at the disposal of the entire class of industrial Capitalists."

With the State Socialists, Rodbertus and Lassale, the immediate precusors of Karl Marx, land was a free gift of Nature and that it, therefore, should be nationalized, private property in it being only allowed in special cases, for example, as a return for special services rendered or as a special gift in a particular case. Marx himself was largely influenced by this doctrine, and if we bear this in mind we can easily appreciate the following passage from Mr. Cahn :—

"Now as to Earth! Surely, if the earth is creator of value, it ought to get its sharea of it, perhaps in the shape of plenty of manure or other betterments. Now there come along a number of persons who claim that they are representatives of the earth and demand its share in the form of rent. If any body tries to hold out that the human race was put on this planet, etc., they interrupt impatiently saying that they do not know anything about planets; that the earth is real estate and always was; anyhow the law says it is and that in fact they need not rent out at all, but could tell the population to betake themselves off that planet

And as the proposition that the law is always the expression of morality, they submit and pay rent. The ground rent pumped out by the landowners from the capitalists is part of what the latter have pumped out of the workers. If the capitalist is his own landlord that does not change the situation for other people.

"The Earth is one of the sources of value:—This completes the Mystery, and the truth seems buried beyond the possibility of resurrection".

We will end by two suggestive passages relating to the tendencies of modern times and incidentally showing how Mr. Cahn, nursed in the Marxian precepts, views them:—

"The evolution of our social system has progressed so far as to open the eyes of thinking men to an impending radical change in our social system. They see the impressive phenomena of the progressive organization of whole industries ou a national basis; the capitalists deprived of their function which has passed to the workers, mere ownership on one side, possession on the other; growing interference on industrial matters by the Government, national and municipal. All these developments point to the resumption of the control of the industries by the workers; not as individuals, as in pre-capitalist times but as associates and to the ending of the existence of classes in the history of mankind. Already men on 'both sides' more pre-occupied with the problems of to-morrow than with the facts of to-day, are hotly debating the question of purchase or confiscation by the workers, as if it were a terribly momentous question. Is it?"

The following is the last passage we propose to quote. It is an interesting one and is an appropriate end to the many we have set out above:—

"The corporation is the abolition of capital as private property within the limits of the capitalist system of production. The function of capital is divorced from its ownership, and profit presents itself as the plain appropriation of the surplus labour of others. Theoretically the highest development of the capitalist system of production would be reached with the universal holding company, or trust of trusts, and with it the end of anarchy and money. But inasmuch as the development of the monetary system proceeds at a much quicker rate than that of industrial concentration the strain on the former will become acute before the culmination of the latter is reached. The present social system will thus become untenable before it can completely work out its logical ultimate consequences in the realm of industrial organization. However, concentration in most industries is even now sufficiently advanced for their re-transfer to the producers. These most concentrated industries are at the same time the fundamental industries on which all others depend for the means of production, such as coal, iron, petroleum, natural gas, copper, electric works, heavy machinery, chemicals, railroads, etc. The *direct* socialization of these industries, would have the effect of *indirect* socialization of the scattered smaller industries, largely producing articles of individual consumption, as well as agriculture."

We have quoted enough—we should rather think more than enough—to show Mr. Cahn at his best. He is a vigorous writer; his grasp of the fundamentals of the position of the "scientific" Socialists is great; his keenuess of perception adds Zest to his writings. We do not say that he has much improved Karl Marx's position by the modern garb he gives him; nor do we think that he has extricated that great evolutionary Socialist from the pitfalls of his position. But we cannot deny to Mr. Cahn our admiration for his penetrating analysis of modern conditions in the advanced West. The real divergence between capital and labour is beginning to be felt in India to-day and as in the coming years industrialism is likely to be developed by leaps and bounds, it behoves every one to see that the worst forms of industrial life known to the West are not reproduced in the East. The real utility of books of this kind in this country lies in directing our attention to the evils of industriaslism, capitalism and the monopoly spirit of the West so that we might not only avoid them but also take steps in time to see that tendencies of a kind that might help towards their introduction here are checked before they secure a foothold.

ECONOMICS IN THE WEST.

Key Products.

London, 17th October, 1918.—One of the most instructive sights at present to be seen in London is a display which opened a few days since at the Central Hall Westminster of "key products." In this *Journal* there is no necessity to explain this phrase. In fact one of the most conspicuous "key products" shown at Westminster—monazite—comes from your part of the world. What the exhibition aims at is to impress upon the man in the street how important it is to Imperial interests to keep a control of these vital productions and while revealing the danger that there was in the part of losing that control to show what an enormous advance has been made since the war in the British manipulation of essential raw materials which Germany had previously almost entirely monopolised to her own great advantage. In his excellent handbook of the Exhibition Mr. H. J. Mackinder declares that before August 1914, the display could not have been held in this country except by permission of the German authorities "who would scarcely have granted their manufacturers leave to show to England their jealously guarded secrets." Most certainly the exhibition is a remarkable one whether it be regarded as a manifestation of the development of practical science or as evidence of the extraordinary capacity of British scientists and manufacturers for coping with a grave emergency. Not only, as the exhibits show, have we got even with German science but we have actually "gone one better", to use a popular phrase. Take the case of Magnetos as an example. Before the war we were absolutely dependent upon Germany for these indispensable adjuncts of the motor. For a time our position owing to a shortage of the usual supplies was perilous in the extreme in view of the great part that the motor was destined to play in the war. But our inventors were equal to the occasion and they in due course provided the Government and the nation with magnetos which owe nothing to the German invention and are its superior. Tungsten has a story of its own which my readers know very well. As presented at the exhibition it has a very impressive effect upon the public mind. There are diagrams which show the large extent to which wolfram ore from which Tungsten is derived is obtained from the British Empire and the very small degree in which it was treated in Great Britain. The facts brought out are striking in their significance and enable the least intelligent to grasp the nature of the plot by which Germany sought to dominate the commercial world. The dye exhibits in the exhibition, of which there are many and beautiful ones, tell a somewhat different story but they enforce the old moral of the intensity of Germany's effort to be supreme in all the things that really count in industry. Here are shown many beautiful articles illustrative of the progress that British manufacturers have made towards the recovery of an industry which ought never to have been lost. When the war broke out we were absolutely dependent on Germany not only for most of the leading dyes, but for the derivatives from which the intermediate products were made. The position threatened to be ruinous to the textile industry: it was an even graver menace to our military position for from the basic elements of the coal tar process explosives were manufactured. Now leeway has so far been made up that we are successfully producing a very wide range of the most important dyes and soon shall be quite independent of Germany. It is much the same with ordinary chemicals. We are to-day manufacturing what previously were German specialities and succeeding so well that we are actually exporting quantities abroad. Altogether, the exhibition is a splendid example of

British resourcefulness. Incidentally it is a great tribute to the growing power of science as a factor in commerce.

LORRAINE IRON FIELDS.

Possibly before these lines appear in print peace will have been declared. In that event Alsace Lorraine will undoubtedly have been freed and France once more mistress of her cherished lost territory. Not the least important of the consequences of the evacuation will be the deprivation of Germany of the iron fields of *Longwy* and Briey in Lorraine from which she has derived in the past few years, and notably during the war, the raw material of her steel and iron and war munition industries. Before the war *Briey* was French territory—a manufacturing district with a population of 120,000. From it Germany since hostilities commenced has drawn annually 14,000,000 tons of ore, or about one-third of the total required by her for her war production. It is this circumstance which has made her cling so long and tenaciously to the annexed provinces. Bereft of them she realises that her manufacturing position after the war will be endangered. Curiously enough in connection with these Lorraine iron-fields we have had from a French source a reminder of the great part which England played in making them commercially available to the world. The ore delved from the Lorraine mines is phosphoric in character and at the time of the annexation such ore was of small value because of the tendency of the phosphorous to make the cast iron brittle. In 1875 a young Englishman named Sidney Gilchrist Thomas who had commenced life as clerk in a Police Court discovered a process of treating the ore so that the phosphorous was eliminated. For some time he had been unable to attract attention to his invention which was destined to have such a far reaching influence on the iron and steel trade; but eventually manufacturers were induced to take it up and at length at Middlesborough on April 4, 1879, a demonstration was given of the practical value of the new system. The fame of the experiments, as Mr. Gladstone in his well-known account of Thomas says, "went abroad through all lands. But the years of game and prosperity were also years of physical decline, which gradually revealed to him and to his mother and sister, who had but one soul with him, the sentence of miserable death. ...... As he touched twenty-nine his scientific triumph was achieved. On the 1st day of February 1885, when he was still but thirty-four the thread of his life was out." Thomas's process was patented all over the world and from his patent rights he had when he died derived a considerable fortune. But it is characteristic of the man's great mind that he never regarded this wealth as his own but rather as a trust money for those less fortunate than himself in the battle of life. A correspondent who has dealt with Thomas's career in the columns of the *Observer* remarks: "It is interesting to note in connection with the present situation that it was the Thomas Gilchrist invention which rendered it possible for Germany to develop the iron ore basin which she took from France in 1871 and from these deposits not only to become one of the world's greatest steel producers but enormously to assist her agriculture by the phosphorous in the basic slag." Here we find in fact another instance of the debt which Germany's much advertised manufacturing skill owes to British brains.

DEVELOPMENT OF GLASS TRADE.

An organized effect is being made to conduct on permanent lines the development of the glass trade here which has been one of the features of our special war efforts. Before the war in the matter of glass, as in many other fields of industry, we were almost entirely dependent on German sources. Of the entire glassware used only about 20 per cent was made at home. The best class of white bottles were all imported, and most of the sheet glass used was of foreign origin. Our greatest deficiency was

in regard to optical glass which was save as to the productions of one firm all imported from Germany. Arrangements made by manufacturers in co-operation with the Glass Research Committee of the Institute of Chemistry have worked a remarkable change in the situation. We now produce in satisfactory quantity optical glass, chemical glass, surgical glass apparatus and instruments, electric light bulbs, and various types of domestic glass. In point of quality some of these productions are second to none in the world. Experience has shown that an all important factor in glass manufacture is technical skill. This can only be obtained by education and careful training in the workshops and the hope is that now the value of the industry has been proved a systematic effort will be made to establish the industry on an unassailable footing. Recently an important gathering of those interested in glass manufacture was held in the city to take the necessary preliminary measures to this end. Encouraging speeches were made in the course of the proceedings pointing to the value of scientific work in industry and more particularly in this glass industry. One speaker, Mr. A. J. Hobson of Sheffield, said that our economies had made this war a war of engineering and science. We had, he added, accepted the challenge and there was no point in which we had not beaten them. The statement is abundantly justified by all the facts that are familiar to those engaged in industrial work here. We shall end the war poorer in many ways but as against our losses will have to be set a rich fund of experience and many striking achievements in the domain of practical science.

INDIAN EDITOR DELEGATES.

Last night I was present at an interesting gathering at the Hall of the Institute of Journalists at which the Indian editor delegates were entertained. The occasion brought together a very representative body of men in the journalistic world with Mr. J. L. Gorvin, the well-known editor of the *Observer* (who is President of the Institute) and Lord Burnham, the proprietor of the *Daily Telegraph*, playing the part of hosts. Some most useful speeches were made by the delegates who did really good service in impressing upon the audience the need of giving special attention to the industrial as well as the political future of India. Just before they attended the meeting at the Institute the delegates had enjoyed the unique experience of a flight over London in a Handley-Page machine. Though the weather was unfortunately too autumnal to get a really clear view they had a highly impressive glimpse of the vast wilderness of bricks and mortar which we call London. I was told by a gentleman who participated in the flight that one of the aeronautical experts who accompanied the party assured them that even now a flight from London to India would not occupy more than 45 hours. Presumably the time mentioned relates to actual flying work and not to the period necessary for a machine to cover the distance including stoppages *en route*. But even so the statement is marvellous. Undoubtedly we are within near distance of the day when these notes will reach Mysore in as many days as they now take weeks to get there.

ARNOLD WRIGHT.

The Treasury Department of the United States has inaugurated a Federal Farm Loan Board, which has already loaned to the farmers of the nation more than $ 117,000,000. Its outstanding feature is: If a borrower of a large amount pays his interest, he never hears again of the debt. Interest at 6½ per cent not only takes care of that item, but it pays off, in less than a generation, all the money borrowed. The process is called amortization. The syllable *mort*, as in mortal, means death of the debt. From the first the mortgage is struck with death.

INDUSTRIAL NOTES FROM THE UNITED STATES.

Making Paper from Dead Leaves.

Washington, D. C., U. S. A., 15th Nov, 1918.—It is now proposed to make use of fallen leaves for the manufacture of paper pulp. The process, which has been very thoroughly tested out, is simple, rapid and inexpensive. The leaves are first crushed, which reduces the blade to powder, which is carefully separated from the ribs and veins. It is the latter which form the raw material for the paper pulp. They are subjected to a somewhat rapid lixiviation and are then washed and bleached, after which the pulp is ready for use. The leaf powder which remains is useful in two ways, it has been found. It has high food value, since it contains the digestible and nutritious parts of the leaf after the removal of the cellulose. As a food for cattle its nutritious value is almost equal to that of hay, and especially when mixed with molasses and compressed into cakes. The leaf powder may also be used as a combustible. For this purpose it may be compressed into briquettes, either with or without being previously mixed with charcoal powder. The leaves can be transported to the paper mills in compressed blocks, but it is said to be better to build factories near forests or woods in order to eliminate the cost of transportation. Extensive experiments are being carried out at various points in the United States, the results of which are expected to be of material benefit in easing the rather tense situation produced by the scarcity of paper and pulp materials.

A New Source of Sugar.

Much interest was evinced several years ago in the development in the Philippine Islands of the industry of making sugar from the nipa palm, which occur in vast areas on many of the islands. Mr. O. W. Barrett, until recently head of the Philippine Bureau of Agriculture, states that the bureau has finally worked out a process by which it is possible to produce a fairly light coloured sugar, which crystallizes readily, from the kaong, or sugar palm of the islands, which has been used for centuries in the far east. The difficulty in making high grade sugar from the kaong lay in the large amount of organic impurities in the sap. Mr. Barrett, who recently lectured on this subject before the Biological Society of Washington, stated that without any expense for cultivation the sugar palm yields a better crop year after year, for at least twenty years, than does the sugar-cane, and vast areas of it occur in the islands.

Improving the Buzzer for Wireless Telegraphy.

The electrical buzzer is a most valuable instrument in wireless telegraphy work. Early in the development of radio communication the electrical buzzer was employed for testing the sensitiveness of the filings coherer, making certain that the receiving set was ready to respond if a transmitting station should happen to be working. And to this day the buzzer has remained an important adjunct to radio work.

As in the case of other apparatus, the buzzer has undergone marked changes from the crude form employed on bell circuits. The aim has been to obtain a greater rate of vibration from the armature, so that the interruptions would be of a high order. This has called for delicate adjustments and extra good contacts, so that the present radio buzzer bears about the same resemblance to the conventional buzzer that an automobile bears to a wheel barrow.

Typical of present day redio buzzers is one just evolved by a New York electrician. It is fitted with lock nut levers for permanently locking the adjustments after the proper pitch or note has been obtained. No tools are required. The base is of composition, while the black-enameled brass case is fastened on by a bayonet socket arrangement.

This buzzer, which is necessary for exciting radio oscillating circuits for measurement work and detector tests, has been approved by, and is in use by, the United States Navy. It can be adjusted to give a tone of 500 cycles or one thousand sparks per second, simulating the signals of most modern transmitters.

CANDLING EGGS.

In the United States a knowledge of "candling" is considered essential to egg grading. Grading is becoming more and more customary in the sale and purchase of eggs, because only by candling can it be made certain that shipments of eggs comply with federal, state and other requirements, and because the most important quality of an egg—freshness—can be best judged by candling. The process, in simple terms, is to hold an egg before a shaded light in a darkened room, and by noting certain characteristics seen through the semi-transparent shell to determine its edible and marketable qualities.

Farmers or small gardeners with only a few eggs to market improvise a candler by placing a stove-pipe over a kerosene lamp, cutting a small hole in the pipe, level with the pipe. The egg is held in a slanting position at the opening. It is twisted a few times to the right and left, and then from end to end, so that its entire contents may be visible. Care is taken that the fingers or hand do not conceal small blemishes, which otherwise would be disclosed by the light. The beginner, experts say, should carefully study the general formation of an egg, as this detailed knowledge is necessary for the application of the standards of various grades and qualities.

The yolk ranges in colour from light yellow to orange, and occasionally is olive green. The eggs with olive green yolks are less desirable because of this color, but are considered edible. The yolk is contained in a delicate membrane and on its surface is a small, light-colored circular area called the germinal disk, from which the chick develops. The yolk always floats in the white, with the chick spot on top. Around the yolk lies a small quantity of thin white and then a heavy layer of thick white Twisted, cord-like coils of opaque white material called chalazæ extend from the yolk through the white toward each end of the egg and hold the yolk in position, yet allow it to turn freely.

Between the white and the shell are two fibrous membranes with an air space betweeu them. When first laid the contents fill the entire egg, but when the egg cools the contents shrink, and these membranes separate, forming an air space. The size of this air space is important in determining freshness of an egg. As the egg ages the air space increases in size. Most bad eggs have enlarged air spaces.

A fine, thick white is found in a fresh egg, and a week thin white in a stale egg. As the egg becomes stale the amount of thin white increases and the amount of thick white decreases. Several classes of bad eggs are indicated by discolored whites.

The yolk of the fresh egg, when twirled before the candle, is seen dimly as a dark object moving slowly in the white. The yolk of a stale egg is seen more plainly than that of the fresh egg. When the yolk is so weak that the shake of the egg in candling causes it to break it is graded as unmarketable. In the fresh egg the yolk is slightly above the centre in the large end of the egg. As the egg becomes stale the yolk floats higher and nearer the shell.

The start of incubation in a fertile egg may be detected by a reddish glow surrounding the germinal spot. Such eggs, although considered edible by specialists, are not graded as "firsts." This reddish glow is entirely different from the so-called "blood ring," which indicates that the egg is unfit for food. Where there is any doubt as to an egg's fitness for food purposes the candler

should give the consumer the benefit of the doubt and reject it.

Controlling the Temperature of the Soldering Iron.

Electric soldering irons, because of their great convenience, have come into extensive use in this country. One point of objection is raised, however, because of the trouble occasioned on some kinds of service due to the burning out of the heater unit.

The reason for this will be readily understood. Heat is generated in the iron by passing electric current through the coil of the heater unit. As the iron is applied to the work heat is drawn from it into the other metal, and as long as heat is thus drawn off and used a satisfactory working temperature is maintained.

Now, if the metal body on which the iron tip is applied is too light in proportion to the iron, or if the iron is not applied to any work and the current remains "on," little or no heat is conducted away, with the result that the coil overheats and there is the ever-present possibility of a burn-out. If the current is always turned off tne iron cools off and time is wasted when it is again wanted.

A device has been developed which operates on the principle of the telephone receiver hook in that the weight of resting the iron on the support or hook bears this down and inserts resistance in circuit with the iron. This reduces the current consumed when the iron is not in actual use, but does not cut it out entirely, hence the iron does not become cold. When the iron is lifted from the support the resistance is automatically cut out of the soldering iron circuit and the iron gets full current and is ready for use.

The device thus provides a convenient support for resting the iron, and insures against the burning out that may happen when an iron is left with current "on," and saves time by keeping the iron ready for use.

Hardening Steel Automatically and Accurately.

Based on the fact that carbon steel at its non-magnetic point is at the best temperature for quenching for the purpose of hardening, an automatic detector has been perfected by an American company, which the company fits to electric heat treating furnaces.

The furnace chamber consists of an inner pot, which contains a special mixture of salts having a comparatively low melting point but a high vaporizing point. The point is wound with a heating coil, and is provided with a special heat-resisting lagging. Around the outside case of the furnace is wound an insulated copper coil, the ends of which are connected to a special galvanometer. A current of electricity passed through the heating coil quickly heats the furnace and renders the salt mixture molten, and also magnetizes any steel article that is placed in the pot. When the steel has been heated to the non-magnetic point the consequent deflection of the galvanometer needle informs the attendant that the best temperature for quenching has been reached. A four-inch furnace will, it is stated, harden ten pounds of tools, gages, or other articles within an hour.

Increasing Carrying Capacity of Underground Cables.

The carrying capacity of electrical cables depends primarily on the heat developed in the passage of the current and the thermal resistance of the surroundings, *i.e.*, the resistance offered to the conduction of the heat developed. With a copper cable of specific dimensions and a certain current, the first element is fixed; but there are still methods of improvement in regard to the second. If, for example, the duct surrounding the cable could be filled with some

suitable insulating material, offering considerably less thermal resistance than air, this would be a decided advantage.

There has recently been described here an experiment in which the substitution of crude vaseline for air in a cable duct was found to diminish materially the thermal resistance and corresponding temperature elevation. It remains to be seen whether on a large scale vaseline is a suitable substance for use in this way; but it is impossible that some economical substance may be found for replacing air in underground cable ducts, thus increasing the safe electric carrying capacity of the cable.

A Flexible Mold for Pipe Joints.

There has lately been devised a good method of using a flexible mold for pouring cement sewer-pipe joints. This mold can be used in close places, where it can be drawn about the bell and spigot with ease. It is only necessary to dig a trench wide enough for a foot on either side of the pipe line. It is not necessary to work around the joint, for when the form is tightened there need be no further worry about the bottom and sides of the joint being properly formed when poured. The form consists of segments rung together on two flexible cables, each of which tightens up independently by adjustment of the thumb screw in the latch. An extra body of joint material outside the bell acts as a gate in regulating the flow of the liquid material around and in the bell, and also increases considerably the strength of the joint. On the whole, it would be difficult, indeed, to imagine a more satisfactory solution of the problem of dealing with a pipe joint in cramped quarters.

Alfred T. Marks.

NOTES.

In this issue among other articles, we publish one on the Forest Products Laboratories of Canada by Mr. A. G. McIntyre, B.A., B.Sc., their Superintendent. This paper is of special interest to us in Mysore, where forestry and forest products are claiming increasing attention. Laboratories of practical research of the kind described by Mr. McIntyre are of the greatest utility. One of their declared objects is the prevention of waste in the practical use of wood. Another is to serve as a public bureau of information on the properties and utilization of forest products. We in Mysore have been developing a special forestry section and it seems but right that work of the kind described in Mr. McIntyre's paper should, as time goes on, claim its attention. Our forests yield a large revenue but what we make from them now can, perhaps, be considerably increased if work of the kind that Mr. McIntyre describes is undertaken in our State. We may make a small beginning, the present Special Forest Officer's office forming the nucleus for it. As time goes on, and as the work is appreciated by the people and the Government, its staff and the expenditure on it may be commensurately raised.

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The State scheme for the assistance of the British dye industry in aid of developments, extensions, and research, was issued by the British Board of Trade, short while ago, as a White Paper. The financial assistance proposed is of two kinds—(*a*) loans, (*b*) grants-in-aid of (1) buildings and plants, and (2) research. It is explained that the primary object of the financial assistance is to ensure that the requirements of the textile and other trades of the United Kingdom and of other parts of the British Empire, which are largely dependent upon an

efficient supply of dyes, are met within a reasonable period to an extent sufficient to make them independent of German dyestuffs by placing at their disposal a reasonably sufficient variety of colours of British manufacture and of satisfactory quality. It is no part of the object of the scheme to assist financially the formation or development of any dye-making business in the interest of the business as such, but it is recognised that the developments of the manufacture of dyes on a scale more than sufficient to meet British requirements, and enabling a substantial export trade to be carried on, is most desirable if the industry is to be firmly and permanently established, and the cost of production brought down to a point which will make competition with the very large scale industry of Germany commercially possible. If the industry is established sufficiently to meet British demands at reasonable prices, the object of the Government will be attained. Grants-in-aid of the cost of building and plant are intended to compensate for the increase in the cost over the normal, and to meet special depreciation and absolescence, or for other special circumstances, due to war conditions. These grants are not to exceed 40 per cent of the cost of the buildings and plant, aud the grants-in-aid of research are not to exceed 40 per cent of the annual cost of laboratories. Loans and grants are to be used in such manner as in the opinion of the Board of Trade is best calculated to develop in the shortest time the manufacture of those colours which are not inadequate supply, and no loan is to exceed 50 per cent of the net value of the material assets of the firm concerned. No manufacturer receiving State assistance shall pay a dividend or distribute profits amounting to more than 8 per cent on the capital until the conditions of the loan or grants are fulfilled. Loans are repayable within twenty years, security to be given if required. Manufacturers are to undertake to supply their products at reasonable prices, and the Board of Trade may fix prices should it be of opinion that they are unreasonable.

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An official review has been published of the annual report on the working of co-operative societies in the Punjab from the year ending July 31, 1918, In the report we find that the set-back in repayment of loans made by societies was slight when compared with the previous year. The year was not a favourable one for the cultivator; and the Lieutenant-Governor is inclined to endorse the Financial Commissioner's view that too great a stress should not be laid on the decrease in repayments of loans, which Mr. Calvert regards as an indication of the small proprietor's inability to secure the full benefit of high prices. The smallness of the set-back was really, it is pointed out in the review, a striking proof of the high degree of protection against seasonal vicissitudes that co-operative credit in the Punjab has now achieved. There was also a gratifying reduction of Rs. 6 lakhs in the amount of external debt owed by primary societies. Some 5,500 members and 122 societies were weeded out as not conforming to the true spirit of the movement and other general reforms are making steady progress. Much attention is also being paid to the education of the staff in the principles of co-operation and agricultural qnestions.

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Looking at the salient features of the year's work we see that with four new central banks and unions added during the year there are now 45 of these institutions, the first central bank having been established in the Punjab in 1909 and the first union in 1910. The demand for money for War Loan investment during the year resulted in considerable withdrawals of deposits from central banks but War Loan investment was facilitated by the ready availability of these funds and the central banks were not seriously embarrassed by the depletion

of their resources. The sum advanced on loan by these banks was Rs. 38·9 lakhs against Rs. 41·9 lakhs in the previous year and Rs. 46 lakhs two years ago. The sphere of utility of central banks, in future, will, it is anticipated, lie more and more in fostering the growth of new societies and financing untried ventures. Their cash balances are now Rs. 2·3 lakhs while those of primary societies are Rs. 7·6 lakhs, the paid-up capital and reserve funds of the central banks amounting to Rs. 26·5 per cent of their total liabilities. While these figures are not unsatisfactory it is emphasised that the nature of the ultimate security upon which co-operative credit is based is essentially fixed and unrealisable, and it is, therefore, important to maintain adequate liquid reserves. Agricultural primary societies increased by 520 to 3,937 and their members to 125,040. hare capital and sums on loan have also increased, while loans repaid are slightly less. Sums advanced by Government have been reduced from Rs. 52,766 to Rs. 17,252 and the gross external debt from Rs. 43 lakhs to Rs. 37 lakhs.

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We extract the following from the Report on the General Administration of the Kolhapur State for the year 1917-18:—The yield of hirda (myrobalan) crop was satisfactory during the year. The amount of hirda collected increased from 17,742 khandis 18,209 khandis. But the revenue from its sale fell from Rs. 1,58,919 to Rs. 1,44,591 which was due to the decrease in the selling prices. The expenditure incurred for collecting hirda and bringing it to Lolhapur railway station increased from Rs. 81,136 to Rs. 86,140. The increase in expenditure was partly due to an increase in the cart-hire rate during the year. The old plantations at Boragaum in Panhala Peta and other places were in good condition. Bamboo clums 5,910 in number were planted during the year. As the experimental factory of wood-distillation at Dajipur has proved successful, it has been decided to increase the number of retorts from 5 to 20. Out of the products, charcoal of Rs. 500 were sold during the year. Other products, namely tar and Pyroligenous acid, remained unsold. There is a demand for Ayroligneous acid from the Munitions Board and a trial consignment has been been made. The Conservator of Forests, Belgaum Division, sent six varieties of wood for testing and ascertaining their economic value. The tests were carried on and the result was found satisfactory. The total receipts frem forest revennue decreased from Rs. 1,26,865 to Rs. 23,645 and the expenditure from Rs. 1,43,218 to Rs. 70,863 during the year. The decrease in the revenue is only nominal and was due to non-adjustment of the amount received from the sale of hirda during the year.

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The Madras Board of Revenue's season and crop report for the year 1917-18, jnst issued, points our tbat commercial crops displaced to some extent the food crops whose need has become so patent in the last few months. With the increase in speculative dealings in cottou in Bombay, it was not perhaps to be expected that their effecteds would not be perceived in the agricultural operations of this presidency. "Ryots were thus induced," we are told in the report "to put every possible acre under cotton, and in the soutbernmost Cambodia was grown as second crop on wet lands. This naturally led to a scarcity of fodder and to some extent of food grains." The Board's explanation of the rise in prise of rice is noteworthy. "The price of rice," they write, "has risen steadily throughout the year—not, on account of wholly local shortage, but in general sympathy with the rise in price of cotton and other commodities, and also because of the lack of freight from Burma which has resulted in a rise in price in Ceylon and in those larger towns in India which use Burma rice. There was great difficulty in exporting rice by rail from the Tanjore and Godavari deltas."

On the condition of the agricultural population and rural economics, the Board observes that the year has been one of rapidly increasing prices and this has everywhere upset rural economics. In the cotton tracts the actual ryots and the middlemen have made very good profits, and the coolie class has been getting excellect wages,—up to 8 annas per per day for men in the ceded districts and 4 to 6 annas per day for women in Tinnevelly. But the cost of food grains and clothing has been rapidly increasing also and there can be no doubt that the working classes have been feeling the pinch in many place owing to the rise of wages not keeping pace with the rise in cost of living. Similarly in the rice tracts all actual producers have benefited but the coolie classes,—although securing sufficient actual food from their wages paid in kind,—are hard put to it to purchage cloths. The West Coast has suffered owing to the failure of the staple product—the cocoaut—to raise in price in sympathy with other produce.

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The *Board of Trade Journal* says that the paper pulp industry in Karafuto (Japanese Saghalin) is being developed further, and it is expected that the total annual output of pulp will soon reach 100,000 tons. The timber resources of the colony are estimated at 300,000,000 shakushime (shaku = 11·93 inches), which can be exploited at the rate of 3,000,000 shakushime a year. If half the amount is used by pulp manufacturers they can turn out pulp to the amount of 100,000 tons a year. At present, according to the *Yokohama Chomber of Commerce Journal*, pulp mills there produce only 50,000 tons a year, and there is enough room for further enterprises. This chance is now being taken by two companies. There are two mills at Toyohara and Otomari which can turn out 20,000 tons a year. There is also a big mill at Ochiai which can turn out 10,000 tons a year. The concern has alreadly half completed an additional mill at Higashis—Tomotori. Another mill at Tomarji turnout 20,000 tons a year. This last is also erecting a new mill at Maoka. The annual output of pulp at present is valued at 12,000,000 yen, but on the completion of the new mills it will be easily doubled. Japanse paper mills, it is stated, can soon be practically independent of foreign pulp suppliers in these circumstances. There are troubles in the way of pulp manufacturers, but the Karafuto Government is going to help to overcome them. The colonial authorities will try to raise money by loans next year, and complete railway systems and harbour accommodation there.

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We have received the following note from the Imperial Institute:—Since 1916 the Hides and Tanning Materials Committee of the Imperial Iustitute have been at work on the difficult question of finding markets within the Empire for the Indian raw hides and skins, which before the war were exported to foreign countries, the hides chiefly to Germany and Austria and the skins to the United States. The Committee have presented several reports, which are under consideration by the Government of India and in due course full information as to the results of their deliberations will no doubt be made public. It is clear, however, from the lecture given recently before the Royal Society of Arts by a member of the Cemmittee, Sir Henry Ledgard, that the Committee are convinced that a market for these hides can be found within the Empire, partly by increased tannage in India and partly by export to the United Kingdom and to the Dominions, especially Canada, Australia and South Africa, and it is known that the Committee have already taken action to familiarise tanners in Canada and South Africa with the good qualities of Indian hides. The first step towards effective post-war action

in connection with hides and skins, as with other essential raw materials, is complete and accurate knowledge of the trade. The Imperial Institute provides this information in an article entitled "Indian Hides and Skins" published in the current number of its Bulletin (No. 2 of 1918: John Murray, 2*s*. 6*d*.) just issued. The article deals exhustively with Indian sources of supply of hides and skins, estimates the present output in comparison with that of other competing countries and discusses in detail the trade figures in pre-war times and the changes in destination of exports brought about by the war. This information should be of great value to all concerned in this trade and the industries depend on hides and skins as raw materials.

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It is reported that coir belting now being made by at least two firms of standing in India. For drives without any striking gear the belting would seem to answer excellently. Coir belting is often said to be liable to slip, but this difficulty is overcome by adopting the following precautions, which are advised by the makers: "In tbe first place, whether the pulley be of iron or wood, it should he thoroughly coated with Stockholm tar before the belt is put on, a fresh coating being applied if the first coating is found to be wearing off. The best time for applying tar is after work in the evening, so that the coating remains on the pulleys overnight. It is also advisible daily, at frequent intervals, to apply a few drops of tar to the belt itself while in use. It is not advisible to fit the belts too tightly, as long drive belts are found to run better and last longer, if adjusted a little slack".

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We note from the Baroda Administration Report for 1916-17, a copy of which has just come in, that almost all the old industries worked continuously and at a profit. The Cotton-seed Oil Mill changed hands and started work. The Rosy Tile Works at Ajrai expanded their factory. Among new industries may be mentioned the one at Petlad for manufacturing writing slates and the Vaso Slate Pen Factory which has begun turning out writing pencils similar to slate pens. A Bombay gentleman has been given concessions for working limestone deposits at Dwarka; and the ochre and China clay at Kot-Rampur have been leased out. Infant industries were financed to the extent of Rs. 105,000. The hand loom demonstrations resulted in introducing a number of fly-shuttle looms, improved dobbies and hand-warping machines. Scholarships were given to a potter and a shoemaker to learn tile-making at Mangalore and shoemaking at Cawnpore. In fisheries although the experiments at the Government station were very successful, people were slow to take to the new methods. The Kotda creek was improved to attract small fishing vessels. In the investigation of the Gulf of Cutch, pearl beds were not discovered but the window-pane oysters which were distributed in several places have promised to thrive. A soap expert was engaged for a short time. He organized a Soap Department at the Hind Candle Works, Hillimora. Purchase of such Government Stores as are locally available has been made compulsory. The Director of Commerce conducted a few special enquiries into the existing conditions of guilds and crafts, into the social and economic condition of two regiments of the Baroda Army and into the question of old age pensions. The reports of these enquiries were under preparation.

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The *Board of Trade Journal* says that the question of the designation to be borne by the Commercial Intelligence Officers appointed in foreign countries in connection with the reorganization of the Government system of commercial intelligence has been under consideration. It is felt that the title

of Commercial Attache is not the most suitable, and that some other designation should be adopted to indicate the inauguration of a new system. It has consequently been decided shat the designation of these officers should be altered as follows:—

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Commercial Attache, 1st grade, to be called Commercial Counsellor of Embassy.

Commercial Attache, 2nd grade, to be called Commercial Secretary of Embassy (1st grade).

Commercial Attache, 3rd grade, to be called Commercial Secretary of Embassy (2nd grade).

Commercial Attache, 4th grade, to be called Commercial Secretary of Embassy (3rd grade).

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According to statistics recently published by the United States Geological Survey, the output of manganese and manganiferous ores in the United States 1916 amounted to Rs. 26,997 tons of ore containing 40 per cent ofmanganese or more; 176,130 tons of 15 to 40 per cent manganese, and 372,673 tons of 5 to 15 per cent manganese. The comparative totals of the preceding year were 8,708, 70,202, and 126,438 tons respectively. The imports of manganese ore in 1916 amounted to 576,321 tons, of which 471,837 tons came from Brazil and 51,960 tons from India. The preceding year's report showed 320,778 tons, including 275,579 tons from Brazil and 36,450 from India. The output of magniferous zinc residuum in 1916 was 198,817 tons. This compares with 159,318 tons in 1915. The ferro-manganese produced in 1916 was 224,103 tons and of spiegeleisen 182,837 tons.

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Enquiries were recently undertaken by the Department of Statistics, India, regarding the sugar producing capacity of the sugar factories in India. Of the forty-six factories to which enquiries were addressed, returns from thirty were received. Of the remaining sixteen, six did not give any reply, six others were either closed or were not in working order, business was not started by two, one was opened only in August, and one was omitted as it produced only molasses. The results of the census show that the thirty factories turn out per day of twenty-two hours, 4,900 maunds (of 82·3 lbs. each) of sugar from cane (first sugars), 2,100 maunds from cane (second sugars). 7,200 maunds from raw sugar, 3,600 maunds of molasses from cane, and 3,700 maunds from raw sugar, employing on an average 8,600 persons daily. The maximum amount of sugar that can be produced by these factories is, according to the returns furnished, 14,500 maunds (or 533 tons) per day. The details for the provinces are given in the statement below:—

Province	Number of factories	Sugar produced from		
		Cane—first sugars.	Cane—second sugars.	Raw sugar.
		Mds.	Mds.	Mds.
Bihar and Orissa ...	13	2,853	758	1,262
United Provinces...	9	1,015*	802	1,737
Madras ...	5	975	507	1,411
Bengal and Punjab.	3	32	17	2,823
Total ...	30	4,875	2,084	7,233

Province.	Molasses produced from		Maximum production.		Average number of persons employed daily.
	Cane.	Raw sugar.	Sugar.	Molasses	
	Mds.	Mds.	Mds.	Mds.	
Bihar and Orissa ...	1,554	1,156	4,829	2,606	3,008
United Provinces ...	1,142†	1,592†	3,831	2,936	2,053
Madras ...	861	828	2,246	1,233	2,676
Bengal and Punjab ...	22	139	3,550	324	850
Total ...	3,579	3,715	14,456	7,099	8,587

* Inccludes production of second sugars in one factory, sparate figures not being available. The high proportion of second sugars in the United Provinces is due to the fact that ration sugar of about 98 degrees polarization manufactured for the Army Department has been classed under "second sugars."

† Excluding production of molasses in one factory, information not being available.

The Department acknowledges its obbgations to manufacturers throughout India for their invaluable assistance throughout this enquiry. The suggestion which has been made to hold the enquiry periodically as a guide to the progress of the industry is a valuable one and we are glad to hear it is now under consideration.

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Topical Life says.—Having studied what Mr. Wynne Sayer and others have had to tell us concerning sugar production in India, and carefully read our book on the subject, those wising to see India go ahead as a sugar producer and exporter will turn with delight to the May issue of the *Mysore Economic Journal* with two articles on the subject, viz., "The Indian Sugar-cane Industry," by Mr. C. A. Barber, the Government Sugarcane Expert, Madras and on "The Sugar Industry" by Mr. N. Lakshminarasimaiya. Between these two articles a good deal has been added to the current information on the subject. The same mail also brought us a letter from Dr. Barber, in which he discusses the future of sugar production over there as compared with the output of jaggery and gur in the following, among other, sentences: "India is an enormous producer of jaggery and gur, an important food of the people, but which cannot economically he made into sugar. My job is to introduce better varieties of canes to give bigger and better yields, and there is great room for improvement in this respect. "In the Peninsula we grow the thick cane of the Tropics, but in the great sugar areas outside the Tropics—roughly ninetenths of the whole—mere reeds are grown, and it is idle to expect much increase in tonnage from them except along the lines of work at the cane breeding station at Coimbatore." Dr. Barber, as all those interested in sugar-cane production in India will agree, deserves our thanks for the way in which he has generally improved the quality of the thick canes grown in the Peninsula. His work has been acknowledged locally, as it deserved to be, and it has been estimated that his efforts stand to give the ryot cultivators a disticnt gain of Rs. 27 lakhs a year, say in round figures £200,000, and yet the public, or its legislators, continue to grudge money spent on research and experimental work in connection with the output of food stuffs in India and elsewhere. Oh, most stupid and shortsighted public, who cannot be liberal even now when they are forced to wear hunger belts aud pay such high prices for such indifferent foods in some places! Stimulated by his success in the south, Dr. Barber is now hoping to do equally saitsfactory work in Northern India. We feel quite sure that neither Dr. Barber nor those dependent on his efforts will be disappointed.

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A Press note of the U. P. Board of Industries says:—A meeting of the full Board of Industries was held at Lucknow on 18th December, 1918, to discuss the scheme prepared by the Director of Industries for starting a carpentary school at Allahabad. The scheme was approved and recommended to Government for acceptance. A meeting of the Industries section was also convened at which it was resolved that a sub-committee consisting of the following gentlemen be formed to deal with matters relating to the employment of European and Anglo-Indian Officers and men after their release from the army Messrs. E. L. Watson, T. Garin Jones and James Walker a few applications for loans to assist small industries were considered and submitted to Government for disposal.

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We note that a careful summary of the article on the indebtedness of members of Co-operative Societies in Mysore which appeared in this *Journal* (October 1917) appears in the *International Review of Agricultural Economics* of Rome. We shall be glad to hear that the more elaborate survey of a larger number of societies promised us in that article will be taken up early.

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The third meeting of the Education Section of the Board of Industries was held in the Technical School, Gorakhpur on 9th January 1919. In addition to other matters the Board considered the Hon'ble Lala Madhusuddan Dayal's proposal for the opening of a Technical School in Meerut. Further enquiries are being made about this matter. The question of the appointment of a whole-time principal for the Dyeing School was also discussed and the Board resolved to inspect the school at the time of the part meeting before coming to a decision.

GLEANINGS.

The peculiar position of Italy has tended to increase industry in that country more than in any other. Entering the war later than England and France, the Italian motor-car factories were already producing for the Allies before they became belligerents. The Government policy too, has been to keep the motor-car factories on motor work and not switch them over to other classes of engineering. Italy mobilised 5,000,000 men and yet was able to find the motor transportation for this vast army entirely within her own borders. In addition she was able to supply large quantities of motor vehicles to her Allies, including even America. No other nation occupied such a position, for England and France had to appeal to America at an early date and France has always taken about 20 per cent of the product of the Italian factories for army use. Even America, with its immense production possibilities, found it necessary to apply to Italy for motor vehicles and for at least six months the American Air Service in France was entirely dependent on Italy for its transportation. Natnrally, after the first mass of troops had been brought over and transportation became easier this dependance became less and less pronounced. This explains why Italy, which befor the war was noted more for the quality than for the quantity of its motor-cars, has been able to become one of the biggest European producers.

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Since its establishment in 1902 the Industrial Bank of Japan has gone ahead rapidly, and the institution has now assumed a position of first-rate importance in relation to Japanese trade and commerce. The report for the half-year ended 30th June last refers to the remarkable progress made by the foreign trade of Japan since the beginning of the war and the fact that the amount of business transacted by the bank has so enormously expanded evidences the extent to which the institution has participated in this active trade movement. The bank's investments amounted during the past half-year to over 179,220,000 yen, showing an increase of 46,510,000 yen over the figures for the preceding half-year. The directors remark that although money on interest did not command a favourable rate, the gross profit increased, so that the bank made a fair net profit in spite of the fact that a larger sum was devoted to the readjustment of the loss account than had been expected. The gross profits amounted to 6,535,800 yen, as compared with 4,207,500 yen for the preceding twelve months, and the net profit was 1,664,500 yen, against 675,100 yen. During the year, however, the capital has been increased from 17,500,000 yen to 30,000,000 yen, and of the past half-year's profit 826,300 yen represents premium on the issue, the whole of which amount has been transferred to reserve against losses. The dividend is unchanged at the rate of 6 per cent per annum, and the amount carried forward is 80,199,100 yen, as against 62,138,000 yen a year ago.

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The report of the Mortgage Company of Egypt states that, after providing for interest on the 4½ per cent first charge debentures and on temporary loans, and applying a sum of £29,000 in the aggregate in writing down the value of the freehold premises of the company in Cairo, the property acquired by foreclosure and the instalments in arrear, the accounts show a profit for the year of £107,390 7s. 2d.; deducting the amount of the dividend paid and accrued on the 5 per cent preferred shares to March 31, 1918, viz., £50,000, there remains a balance of £57,390 7s. 2d.; adding the amount brought forward from last year's account. £17,382

9s. 6d., there is available for distribution a total sum of £74,772 16s. 8d., which the directors propose to allocate as follows:—(1) to payment of a dividend of 8 per cent, being 2s. per share on the amount paid up on the ordinary shares, £20,000; (2) to general reserve, £17,500; (3) towards writing off the discount and expenses of the debenture issues, £2,800—40,300, leaving a balance to be carried forward to the next account of £34,742 16s. 8d. The economic situation in Egypt has continued to improve, and the increased payments by the company's clients mentioned in last year's report have been maintained during the year 1917-18. The Board have, however, made further provision for loss on arrears and properties acquired by foreclosure. They have applied a sum of £25,000 to writing off a portion of the instalments in arrear, and in writing down the cost price of the property acquired by foreclosure. They further propose to increase the general reserve to £170,000 by adding thereto a sum of £17,500.

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The following statement issued by the Director of Statistics shows the quantity and value of Milk, condensed and preserved, including milk cream, imported by sea into the different maritime provinces of British India during September, 1918:—

Share of provinces.	Quantity.	Value.
	lbs.	Rs.
Into Bengal	49,510	32,348
,, Bombay	299,701	185,635
,, Sind	...	...
,, Madras	39,038	25,088
,, Burma	88,449	56,063
Total ...	476,698	299,134

Mr. Lloyd George said the other day that the wealth of a country depends *less* on its natural resources than on the vigour, the energy, and the training of its people. In other words, it is no advantage to a people for Nature to give them vast agricultural and crop-raising possibilities if they do not learn to acquire the knack of turning those possibilities into actual facts.

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According to the Colonial Report for 1917, the essential oil industry of Seychelles is maintaining its development. New distilleries have been and are being erected. The falling off in export last year of essential oils in no way indicates a falling off in manufacture. Shippers experienced great difficulties in getting away this commodity which finds a ready market in London. A local rope-making industry has sprung up as a result of the war and some excellent rope made of coir fibre and of sisal hemp has been manufactured both in the prison and by private enterprise with very primitive machinery. It has been readily disposed of for local needs and the further development of this industry will be interesting to watch.

SPEECHES AND PRONOUNCEMENTS.

CALCUTTA UNIVERSITY CONVOCATION.

Lord Chelmsford's Speech.

Addressing the Calcutta University Convocation on December 16, 1918, at the Calcutta University Senate House, Lord Chemsford, Chancellor, made a notable speech, from which the following is taken:—

Gentlemen,—

I am delighted to meet you as your Chancellor. I was unfortunately prevented by pressure of work from presiding over your Convocation during my last year. That could not be helped but it had the great advantage of enabling his Excellency the Governor to introduce himself to you as your Rector. And now let me recall to your minds what I said to you on a former occasion. Two years ago when I presided over this Convocation for the first time, I announced to you my intention to appoint a Commission to investigate the problems relating to your University. I said then that the composition of the Commission should be of the strongest possible character on the educational side and that educational problems should be considered with a single eye to educational efficiency. The Commission was appointed and no one can say that its *personnel* does no possess the strongest educational qualifications. For a whole year under the distinguished chairmanship of Dr. Michael Sadler it has been investigating your problems and preparing its report. We are all looking forward with intense interest to the publication of that report and I feel confident that it will be worthy of the distinguished gentlemen who have given their labour and minds to this great task. For myself I should like to say that if the members of the Commission are unanimous in their main recommendations, I shall lose no time in giving effect to them. It would be futile to appoint a Commission of such strength and eminence and then pigeon-hole their suggestions. I hope that the course I propose will meet with general approval and that I shall have the support of his Excellency your Rector and of his Government. I am perfectly conscious that there will be some criticism of, and opposition to, what may be proposed in the nature of reforms, but that is only to be expected in a matter of such complexity. It is scarcely likely that general unanimity on the part of the public can be secured, but I would ask those who feel themselves constrained to take up an attitude of dissent to weigh carefully the questions in issue as a whole before they make up their minds. Let me state them briefly. In the first place you have in this university a student population which is the largest of any university in the world and without a parallel. You have some 23,000 students preparing for university degrees and those students are not concentrated in Calcutta but dispersed ever a wide area.

This vast multitude is under the control of a single organization. It pursues the same studies, assimilates the same text-books and goes up for the same examinations. Moreover, as if this were not a sufficient task for one governing body, the same body is responsible for the care of more than 600 schools. Again, of these 23,000 students some 19,000 follow purely literary course which lead only to clerical and law careers. I will repeat to-day what I said to you two years ago. "So long as students think that the only avenue of employment are in the legal and clerical professions, so long shall we get congestion and overcrowding in those professions with consequent discouragement, disappointment and discontent." Once more when I had the opportunity of visiting you, I was much struck by the fact that a large number of students seemed to be doing work which should have been done at school—and not in a university. If this be so, it must necessarily follow that the colossal numbers of your university are in some measure due to the influx of students who should still be undergoing their school course and the consequent strain on the administrative and teaching organization can will be imagined. Once more your university has in large measure followed the lines of development of the London University. It began by being an affiliating university and as such confined itself to the conduct of examinations like the London University. It realized that this was not the primary function of a university, and it began to graft upon itself the function of teaching again like the London University. If found I think I am not putting this too strongly that a material charge could not be effected from within and that external help was necessary if true reform was to be effected on sound lines. These facts, and I have confined myself to what will leap to the eye of any observer, should give us all cause to think and they bring out that which I hope the general public will realize, the colossal character and complexion of

the problem which Dr. Sadler and his colleagues have been asked to solve, and surely no one can doubt that the time is ripe for a solution of this great question. Education lies at the root of most of our difficulties, and if we are to advance surely along the path of constitutional reform we must see to it that we put our educational system on the soundes' basis. The time then is ripe for reform in this matter, but coincident with Professor Sadler's commission another commission has been sitting investigating the openings for the profitable employment of Indian capital in commerce and industry. But we do not want merely Indian capital, we want Indian men and not Indian men only as labour but as leaders who will turn their attention to industrial enterprise and equipped themselves for a great industrial regeneration in India. We want to see men devote themselves to scientific research. We want to divert some of the great stream of students which now pours into channels leading only to the clerical and legal professions into channels which will lead to industrial and commercial enterprise. We have now before us the Report of the Industrial Commission which tells us this may be done. I can assure you that in the case of this report, too, I have no intention of letting its volumes moulder upon ourselves. Action has already been taken upon it and before the year elapses I hope to see the foundations laid of a scheme for progressive industrial development in India. But let me once more emphasise the point, that is, the men we want to do this thing. If the men are forthcoming, there will be no difficulty about money. Capital will go where it sees possibilities of advantageous use. I have every confidence that we shall see this industrial renaissance come about, and where could it more fitty be inaugurated than in this the premier university in India.

I commend this to you. All these two Commissions will have furnished us with information of what can be done and how best it can be done. It entirely remains for us to obtain your co-operation. The personnel exists among you if only it will equip itself for this great task, and now I come to some personal aspects of your university life. I cannot omit a tribute to the work of Sir Deva Prasad Sarbadhikari, your late Vice-Chancellor, whose faithful discharge of his stewardship during a prolonged tenure of office cannot have been accomplished save at the cost of much time which would otherwise have been devoted to the calls of his profession. It is a matter for congratulation that his labours in the cause of education have been recognized both by the King-Emperor and by British universities. His period of office coincided with the new problems and unusual difficulties associated with the war and he proved himself alive to the spirit of the times by the enthusiasm he displayed in supporting the creation of a university crops embodied in the Indian Defence Force. I trust that the impulse which led to the introduction of this new and valuable feature in your university life will not die away and that you will all continue to take a pride in the discipline and efficiency of your university crops. Your present Vice-Chancellor, Sir Lancelot Sanderson has undertaken the duties of this office with greatest self-sacrifice in addition to the heavy work and responsibility involved in his official appointment and I regret to say to the detriment of his health. He deserves the gratitude of all who are interested in this university and here I would make a general observation. During the sixty years of its existence your university has enjoyed the gratuitous services of a succession of illustrious and busy men who, have not hesitated when called upon to shoulder a difficult and thankless task and to furnish to its alumni a bright example of untiring public spirit. The work yearly increases in volume and complexity and the question arises whether the time has not arrived when the university should claim the service of a Vice-Chancellor who can devote his undivided attention to its welfare. Among the great men eminent in your records is one who has passed away during the last few days and whose loss casts a gloom over our proceedings. The memory of Sir Guru Das Banerjee, the first Indian to be selected as your Vice-Chancellor will long be cherised among you. His image will rise to your minds as that of one who even in extreme old age retained a buoyancy of demeanour, an alertness of intellect, which ole looks to find among men entering on the prime of life. More than that, he was a living refutation of the view that Western lore is incompatiable with Eastern simplicity and manners. He had drunk deeply at the wells of Western thought and science, yet he held firmly to all that is best in the civilization wherein he was born. He has left an example to us all, modest, untiring, cheerful and large-hearted to the end.

Let me now address myself to the recipients of degrees and the other students who are present and through them to the many thousands of students who thronged the colleges of this the largest university in the world.

When I turned over in my mind the topics that might be helpful and inspiring to them, I was naturally led to think of that mighty event which during the last few weeks has filled all our hearts

with thankfulness to the Almighty. It is to the God of Justice that we owe our victory in this world-wide war, but we may well look to the instruments through which his purpose has been accomplished. The German generation has forty years, growing in power, wealth and indifference. Among other things they possessed an old standing and in many respects an admirable system of education, but that system and indeed their whole national life was corrupted by false aspirations and visions. Their great thinkers preached the loftiest and most liberal ideals but those ideals had no foundation in fact either in the national life or in the real doctrines with which the youth of the country were inoculated. What were those doctrines? They were that an aggressive egoism is a necessity of life, that war is an indispensable agent in policy and civilization, that it is legitimate to use violence in order to upset the existing order of things, and that in accomplishing this end all means however vile, treacherous and cruel, are pardonable and indeed hallowed. Individual culture must yield to national culture. The subordination of all knowledge to the service of lawless force with a view to the enslavement of the world. Bismarck had said that imagination and sentiment are to science and intelligence as are tares to wheat, things to be weeded out and burned. The German university has been described as the creation of a bodyguard of intelligence for the Hohenzollerns. And now I ask, what are the instruments through which this terrible theory of life have been defeated? It is, first, the honest and hearty co-operation of all classes and creeds among the peoples who deprecate such false ideals and none has rendered better service than the variety of nations which make up the vast British Empire.

From every continent they have gladly flocked knowing that they lived under a reasonable dispensation which sets justice and toleration before force and a grinding uniformity. Not least has India risen to the occasion. At the very beginning of the war she was stripped of men and munitions and she has continued to send her tens of thousands of sons to fight, often to perish, in the various theatres of the war. And why was there theatre of the war? And why was there this spontaniety of effort to preserve the Empire? Why have our Colonies, our Ruling Princes and all our wide Dominions poured forth men and money in its defence? Because its motto, unlike that of the Germans is "live and let live." Maintain the peace but maintain also the common right of man. Secondly, this war teaches us the great lesson of discipline. Without discipline, both individual and national, our cause would have assuredly been lost, but man has subordinated himself to man, nation to nation and hundreds of thousands have at the bidding of duty only undergone unheard of privations but advanced cheerfully to certain destruction. Britain was utterly unprepared for a war on land and it was the sense of discipline instilled in her schools and unconsciously in her public life which led her people gradually to impose on themselves the unwonted and too many unwelcome yoke of conscription. Was this a sense of disipline that nerved out tiny army fighting in France in the autumn of 1914, and kept up its spirit? I was recoiling under the blows of overwhelming legions. It was this same sense of discipline that saved the world again in the early months of this year when the eastern German armies released from Russia stuck blow after blow in their second rush towards Paris and the Channel parts. The same sense inspired the armies of our glorious Allies, and above all our Fleet, who doggedly persevered in the often unappreciated task of keeping the seas open' depressed by the everwanting chance of meeting their foe fairly and squarely in order of battle. The same, too, steadied the nations in those awful crises when a stricken Europe lowered her head before the storm, those terrible times when it seemed as though calamity had but begun and when the vanguard clouds had spent their malice and the sullen rear was with its stored thunder labouring up. Unity, discipline and I may add loyalty have been the instruments through which the good cause has triumphed.

And now a word of caution. We have got to face the appealing task of reconstruction and those same qualities which have served us faithfully in war must again be exercised if we are to deal successfully with the problems of peace. The self-denial, and enthusiasm which they involve will be displayed in other ways but are equally essential whether in Europe or in India in matter of domestic concern or in matters touching the whole fabric of our Empire. We can advance to meet these questions strong, in the faith which that Empire's record in the war has inspired by the ideals which our sword has vindicated, going forward inspired of mutual self-respect, quickened by the memory of what we have together done, united in our devotion to the King-Emperor. The qualities which have served our people and our Alllies in the war and which are essential for success in the task now before us are not to be acquired in a day without serious and consistent endeavour. Their foundations must be laid in the home, the school and the college, obedience to parents and to teachers, assiduity in study, punctuality in habits, the cultivation of the true instincts of sport

in the playing field, and hearty co-operation with fellow students and instructors,—these are the things which fit youth to tackle the problems of life honestly and effectively. Some of you may think that the petty round of daily existence hardly affords scope for the cultivation of the highest qualities and that something more than constant attention in detail of this sort must be required in order that great achievements may eventually be accomplished. But this is a mistake. It has truly been said that though life is made up of details, life itself is not a detail and I can assure you that especially in the plastic period of youth no daily occurrence is too trivial, no action too small for the gradual welding together of that superlatively important fabric, human character.

FOOD SHORTAGE IN MYSORE.

The following Order (No. G. 8450-512—P. P. 134-18-1, dated 11th November 1918), has been issued by the Government of Mysore :—

For some time past the situation in the State in the matter of food-stuffs has been growing in complexity partly because of difficulties of transport due to War conditions and partly on account of the adverse seasonal conditions consequent on the failure of the monsoons. Even the stock now available in the country is not readily coming into the market, in the expectation of higher prices in the future. These have resulted in a considerable amount of distress among the poorer classes.

So far as public opinion can be ascertained, it is in favour of Government assuming a greater degree of control and regulation.

2. As the result of a rough census of stocks prepared as on 1st October 1918, it is surmised that about four lakhs (4,00,000) of tons of ragi, one lakh and ten thousand (1,10,000) tons of rice and forty-three thousand (43,000) tons of jola were available in the State on that date. It is expected that the next harvest, scanty though it may be, will yet yield about two lakhs (2,00,000) of tons of ragi, seventy-six thousand (76,000) tons of rice, and twenty-five thousand (25,000) tons of jola. The stocks on hand, and the next harvest are thus expected to suffice for the food requirements of the State for about 8 to 9 months, from October 1918. It will, therefore, be necessary to augment the stock by imports from outside to the extent of about two and half lakhs (2,50,000) of tons, being the normal requirements of the State for the remaining 3 to 4 months. So far as the information now available goes, the deficit of two and half lakhs of tons will be as under :—

One lakh twenty-five thousand (1,25,000) under ragi.

One lakh (1,00,000) under rice.

Twenty-five thousand (25,000) under jola.

Stocks of ragi and jola are not available from outside the State. The stock of these grains available in the State has therefore to be conserved with great care and distributed to the best advantage throughout the State.

A certain quantity of rice is, however, expected to be available from the provinces of British India where there is a surplus, and Government are arranging to make up for the deficit in the food supply of the State by the import of sufficient quantities of rice. The substitution of rice in the family budget of the bulk of the people, *i.e.*, the poor, is however, costly and can be restored to only as a last expedient.

3. The problem of food supply for the next twelve months thus resolves itself into—

(1) The conservation and distribution of stocks available in the State and

(2) Import of rice from outside and its distribution.

Government have already taken action in regard to imports of rice from outside and the distribution of the imported quantity in the districts through the usual channels of dealers to be licensed for the purpose, co-operative stores, etc., does not present any complex problems.

The conservation and distribution of stocks of ragi and jola and the avoidance of unnecessary movements of stock demand, however, very careful handling.

4. The rules issued under Regulation 1st of 1918 (The Defence of India Regulation) confer ample powers on the Government for the ascertainment of stocks, the regulation of prices of food stuffs and the commandeering of stock at the notified prices. Government have in exercise of these powers already prepared a rough estimate of stocks; fixed maximum prices in respect of ragi and rice in several parts of the State and empowered the Director of Civil Supplies, the Deputy Commissioners of Districts and the Presidents of Bangalore and Mysore City Municipal Councils to commandeer stocks at the notified prices.

5. But the time has now arrived for more systematic action in this matter. The first step to be taken is to have a more accurate and detailed census of stock in the State. A set of provisional rules in this behalf is appended to this order. The Revenue Commissioner is hereby authorised to amplify and

issue them finally for the guidance of local officers, prescribing the necessary forms and registers and to take all other steps needed for the immediate census of stock.

Each town or village will form the primary unit for the census of stock and the estimate of requirements. On receipt of return of stocks from individuals, a register will be written up for the town or village indicating the persons holding stocks; the stock held by each; the requirements for his family and dependents for a year and the excess available for purchase by Government. A summary will be appended to the register of each town or village, showing the total stock available in such town or village; the requirements of the entire town or village *till* the end of June 1919, and the balances of stock available for outside use or the quantity required from outside to make up the deficit.

The taluk will be the next higher unit and a *plus* and *minus* memorandum of stocks in all the towns and villages in each taluk will be prepared together with the net result for the entire taluk. A central clearing-house or depot will be formed at the taluk head-quarter or other convenient centre for distribution of stocks within the taluk and for arranging outside exports.

N.B.—The Kolar Gold Field area will be treated as a separate unit in the Kolar District, the Vice-President, Kolar Gold Fields Sanitary Board, being responsible for all the arrangements under this Scheme.

Each district will similarly be the next higher unit with a central district depot or clearing-house and a *plus* and *minus* memorandum for the taluks of the district and for the entire district will be maintained there. The cities of Bangalore and Mysore will be treated as units corresponding to districts, the Municipal Presidents discharging all the duties of a Deputy Commissioner under the Scheme.

A Provincial depot or clearing-house will also be started at Bangalore City, where the *plus* and *minus* memoranda of districts will be maintained and inter-district movements of stock controlled.

6. The work of organizing the food-supply arrangements on a uniform system and of co-ordinating the activities and the requirements of the districts and managing the Provincial depot require the undivided attention of a whole-time officer. Government are accordingly pleased to appoint an officer of the grade of Deputy Commissioner as Food Controller. The Food Controller will work under the orders of the Revenue Commissioner, who will be held responsible for the supervision and direction of all food-supply arrangements within the State. The work in the districts will, under the direction of the Deputy Commissioners, be attended to by the District Economic Superintendents who will, until further orders, give precedence to this work over their other duties. The Amildar of each taluk will be responsible for the arrangements in his taluk. There will also be one or more Food Inspectors working under the orders of the District Economic Superintendents.

The Deputy Commissioners and Amildars will associate with themselves a local Advisory Committee of leading non-officials and merchants, consisting of from 3 to 5 members.

These Committees will be primarily responsible for arranging for the sale of food-grains as favourable rates to the indigent poor, making up the difference as far as possible by local subscriptions or grants from Municipal and Local Funds.

7. The distribution of duties and responsibilities among the various officers will be as follows:—

The Director of Civil Supplies will be responsible for the import of rice and other commodities purchased outside the State and their delivery at stations within the State indicated by the Food Controller, and for the export of food-stuffs due from the State to adjoining British Districts according to existing understanding. He will hereafter issue Railway Priority certificates in respect of these food-stuffs, only on the requisition (1) of the Food Controller in regard to inter-district movements and (2) of the Deputy Commissioner in respect of movements within his district.

The Food Controller will be responsible for the redistribution of the available stocks in all districts of the State in the most equitable manner and for the distribution of imported rice, etc., in such a manner as to avoid unnecessary movements of traffic. He will also make available the stock due for export to British Districts on the requisition of the Director of Civil Supplies. He will be responsible for organizing a comprehensive system of rationing when such an arrangement is found absolutely necessary in any locality.

The Deputy Commissioners of Districts will be responsible for the equitable distribution of stocks within their districts, the movement of stocks from taluk to taluk within their districts and for the distribution of imported rice, etc., to deficit taluks. They will also be responsible to make surplus stocks of their districts available for other districts on the requisition of the Food Controller.

The Amildars of Taluks will be responsible for accurate estimates of stock in the first instance, for correct forecasts of the next harvest, for distribution within the taluk of allotted food supplies and for

making available surplus stocks and placing them at the disposal of the Deputy Commissioner.

The Revenue Commissioner assisted by the Food Controller will be responsible for directing all the operations in regard to food-supply within the State and for keeping the Government informed from time to time of any developments or principal features brought to notice in the administration of these arrangements.

8. To advise Government regarding the general policy to be followed and to co-ordinate the work of the Food Controller, the Director of Civil Supplies and all other departments engaged on or interested in this work, a Central Commitee will be constituted consisting of the Revenue Commissioner (President), the Inspector-General of Police, the Chief Secretary to Government, the Food Controller and the Director of Civil Supplies, the Food Controller being the Secretary. This Committee will meet once a week at least to begin with till all the arrangements are completed and put into proper working order. The Revenue Commissioner will have the discretion to invite other officers of Government or non-official gentlemen to attend the meetings of the Committee whenever necessary for general consultation.

The Central Committee will prepare, review and issue weekly statements on the state of stocks, imports and exports, etc., and submit copies for the information of Government.

9. The Revenue Commissioner is requested to submit immediately, proposals for the appointment of Food Inspectors and of such other staff as may be necessary for giving effect to the above scheme with all possible despatch. In order to ensure the expeditious taking of stock in the taluks believed to have surpluses, the Revenue Commissioner is authorised to entertain a temporary staff of twenty-five officials on rates of pay ranging from Rs. 50 to Rs. 75 each to assist the Amildars of those taluks. These officials shall as far as possible be selected from among officials of the Revenue, the Police and the Excise Departments employed in the taluk or district concerned. The Inspector-General of Police and the Excise Commissioner are requested to place the services of the officials selected by the Revenue Commissioner at his disposal immediately. As soon as stock-taking is completed in the taluks first selected, these officials may be absorbed in the food establishment referred to in paragraph 6 above.

10. The expenditure under the Scheme will be met by a special grant from the reserve for unforeseen expenditure.

11. The Superintendent, Government Press and Stationery, is requested to comply promptly with the requisitions for stationery and the printing of forms, registers, circulars, etc., made by the Revenue Commissioner or Food Controller. The Revenue Commissioner will also have the discretion to get printing work done at private presses in particular cases.

APPENDIX.

Provisional Rules regarding taking of Stock.

A General Notification will be issued by the Deputy Commissioners of Districts, calling upon all persons holding a stock of not less than five pallas of rice, ragi, jolam or navane or ten pallas of paddy to give a statement in a form to be prescribed, of their stock to the Patel of the village within three days from the date of publication of the notification in the village.

2. On receipt of the statements, the Patel will have them examined and verified by a Village Committee and send a consolidated list for the village, together with the original statements to the Hobli Shekdar within three days. At the same time, he will indicate the cases where he has doubts of the accuracy of the return and apply for a verification by search and actual measurement.

3. Within a week of the receipt of the statements from all the villages, the Amildar will cause a consolidated statement to be prepared for the entire taluk and submit it to the Deputy Commissioner with a statement of individual stocks in the taluk in excess of fifty pallas each. In the case of all such stock-holders, he will immediately proceed to take individual *mutchalikas* in a form to be prescribed binding themselves to hold their surplus stocks at the disposal of Government and not to part with them except with the written permission of the Deputy Commissioner or other officer authorised by him.

4. The Deputy Commissioner will within three days of the receipt of statements of all the taluks, furnish a talukwar statement to the Food Controller.

5. In order to avoid unnecessary cross traffic, the following general rules for the re-adjustment of stocks will be followed :—

(*a*) When the stock in any village is in excess of its requirements for six months, the surplus will be allotted to the nearest deficit village, if any, in the taluk.

(*b*) When the stock in a taluk is in excess of its requirements for six months, the surplus will be allotted by the Deputy Commissioner, to the nearest deficit taluk, if any, in the same district.

(*c*) Similarly, when the stock in a district is in excess of its requirements for six months, the surplus will be allotted by the Food Controller to the nearest deficit district.

NOTE.—In calculating these requirements two pallas of ragi, rice, navane, jolam or four pallas of paddy will be taken as needed per head of population of a year.

6. The surplus stock will be taken over by the Government in such quantities and at such times as the Food Controller or the Deputy Commissioner *may decide. In every case the actual taking over* of the stock will be effected by the Amildar or the Food Inspector in the presence of a Panchayet of not less than three persons.

7. Arrangements will be made through the local Co-operative Societies, licensed dealers and influential raiyats for the storage of food-stuffs commandeered or imported by Government and their sale to the public at rates fixed in accordance with rules to be made by *Government.*

8. In the case of Municipal towns, stock will be taken under the orders of the Municipal President, who will, after verification of the returns by the Municipal Council, forward a consolidated statement to the Amildar of the taluk and in the case of the City Municipal Councils, to the Food Controller *direct.*

COMMANDEERING STOCKS OF FOOD-STUFFS.

Instructions to Local Officers.

The following instructions (Official Memo No. G. 8416-27—P.P. 6-18-36) are issued *for the* guidance of local officers in com*mandeering* food-stuffs for public use:—

1. Under Notification No. G. 7918—P. P. 6-18-30, dated the 30th October 1918, Deputy Commissioners of Districts have been empowered under Rule 3 (B), (2), (c) of the Defence of India Regulation to take over stocks of articles, the prices of which have been fixed.

2. At *present, maximum prices have been fixed* for ragi, rice, paddy and jolam in certain specified areas. Steps are being taken to fix prices similarly throughout the State and orders in this matter will issue in another day or two. Immediately on receipt of these, Deputy Commissioners can take steps to commandeer the stocks of articles, whenever necessary.

3. In the beginning, stocks may be commandeered *from persons holding large stocks. The Deputy Commissioner, either himself or through a responsi*ble officer, may take over the stocks by issuing an order in writing to the person holding stocks to deliver the quantity named to the officer empowered, in such manner as may be suitable. The supplies *required will be drawn from the* several stockholders in a village, on other area, without unduly pressing on any one.

4. In order not to inconvenience the individuals from whom the stocks are commandeered, at least a year's supply for the person, his family and dependents will be left with him. In calculating these *requirements, two pallas of ragi, rice or jolam or* four pallas of paddy may be taken as needed per individual per year.

5. When stocks are taken over, the officer empowered to take delivery will prepare a *mahazar* showing the quantity taken over, as per actual measurement, in the presence of a Panchayet of not less than three respectable local residents. Payment will be made to the individual immediately *on taking over the stocks, and in any case, within* a week, at the price fixed by the Deputy Commissioner in the notice. The stock taken over will be placed in the safe custody of a responsible person and despatched to the destination indicated, or, used to meet the demands of poor people requiring grain, sales being effected to them in small quantities at a fixed price. The sales may be effected through (1) Co-operative Societies where such exist and are *willing to undertake the business, (2) respectable* merchants who may be licensed for the purpose, and (3) where these means are not available, through respectable non-official gentlemen or committees formed for the purpose.

6. Every care shall be taken to avoid abuses.

7. Separate orders are under issue placing an advance of Rs. 10,000 at the disposal of each Deputy Commissioner for commandeering stocks as above indicated. *Further detailed instructions will issue* shortly, but action on the lines pointed out in this memorandum may be taken as required.

TOPICS FROM ECONOMIC PERIODICALS.

SOUTH AFRICAN MANUFACTURES.
Results of the Census.

We take the following special article from the *Board of Trade Journal*:—

It is customary to regard British Self-Governing Dominions and Colonies as being of greater importance economically for their agricultural products than for their production of manufactured goods. The *most striking exception, of course,* has always been *South Africa, where the mining industry* is the life-blood of the country. It will therefore cause some surprise that the results of the Census of Manufactures for 1915-16, recently issued by the Union Government, places the gross value of

goods manufactured in the Union above the value of agricultural products, and not very much below that of the output of mines. It may become necessary, however, to qualify this claim, as a separate Census of Agriculture—which, like the present Census of Manufactures, will be more thorough than any previous Census—is to be undertaken in July. In any event, the official figures now supplied contain striking evidence of the rapid development of manufactures and it will be interesting to watch the respective growths of the agricultural and manufacturing industries in the regular Census returns which are to be undertaken in the future.

SCOPE OF THE CENSUS.

The present operation, described as a Census of the Factories and Productive Industries of the Union, has explicitly excluded mining and quarrying, in respect of which comparatively complete statistics are regularly secured by the Department of Mines and Industries, but has included every "factory" otherwise coming under the following definition :—

A manufacturing or other establishment in the Union—

1. (*a*) employing four or more hands, including the proprietor or manager or other person in charge thereof ; or
   (*b*) employing any form of motive power, excluding manual labour ; and
2. engaged upon any work of production or upon any other industrial process, excluding mining and quarrying, but including any industry relating to—
   (*a*) the treatment of raw material, the product of agricultural and pastoral pursuits ;
   (*b*) the extraction or treatment of oils and fat, whether animal, vegetable, or mineral ;
   (*c*) processes in stone, clay, glass, or such like material ;
   (*d*) working in wood ;
   (*e*) metal, engineering, machinery, and cutlery works ;
   (*f*) the preparation, treatment, or preserving of foods, drinks, and condiments ;
   (*g*) the production of clothing, textiles, fabrics, and similar articles ;
   (*h*) books, paper, printing, and engraving ;
   (*j*) arms and explosives ;
   (*k*) vehicles (mechanically propelled or otherwise), fittings for and parts of vehicles, saddlery, and harness ;
   (*l*) ship and boat building ;
   (*m*) furniture, bedding, and upholstery ;
   (*n*) drugs, chemicals (including fertilisers and by-products), paints, and varnishes ;
   (*o*) surgical, dental, and other scientific instruments ;
   (*p*) jewellery, time-pieces, and plated ware ;
   (*q*) heat, light, and power ;
   (*r*) leatherware ;
   (*s*) house building ; and
   (*t*) any other matter not enumerated above.

DIFFICULTIES IN OBTAINING RETURNS.

The main difficulty experienced in obtaining returns was due to defective systems of book-keeping which were far more prevalent than had been expected. One result of the Census, it is stated, has been to reveal these defects, and to determine not a few industrialists to revise their business methods. To the manufacturer pure and simple the form of return seemed to present no difficulties. One very large firm is quoted as having posted a complete and detailed return within twenty-four hours of the delivery of the form. Where, however, the business of manufacturing was carried on in conjunction with, possibly as a small part only of, a trading businesses ; or where several entirely different branches of manufacture were being conducted under the same management, frequently in the same premises and subject to a common set of books and accounts, great difficulty was encountered in allocating the items of expenditure, capital and production to the different branches. The respective totals could be given with comparative accuracy, but the apportionment of items tended to be more arbitrary.

VALUE OF FACTORY PRODUCTION.

The value of the manufacturing production (including repair work) of the Union in 1915-16, as indicated by the aggregate of the individual returns, was £40,434,882, distributed as follows :—

	£
Cape of Good Hope ...	14,616,427
Natal	9,665,505
Transvaal	14,266,643
Orange Free State	1,886,307
Total ...	40,434,882

The totals as indicated in the returns for the Censuses of 1904 and 1911 were as follows :—

	Census of 1904	Census of 1911
	£	£
Cape of Good Hope...	9,040,579	7,431,727
Natal	3,744,088	4,434,562
Transvaal	6,471,082	4,633,436
Orange Free State ...	274,738	749,109
Totals ...	19,530,487	17,248,834

The above figures for 1904 and 1911 are given because they provide the only data previously collected in respect of the manufacturing industries of the Union. They are not a reliable basis for comparison, since the basis of the returns in 1904 and 1911 was different. It is stated that much was

included in them that more truly represented trading transactions which, as far as possible, have been wholly eliminated from the figures given as the result of the most recent Census. As a special Census of Industries is now to be taken annually in the Union, comparative figures will have more than an academic value in future Returns.

TOTAL PRODUCTION OF THE UNION.

In order to form an estimate of the total production of the Union, the figures for manufacturing production are combined with those of the production of mines during the same period—the latter figure being obtained by taking the average of the years 1915 and 1916, that is, £47,062,184. Until the Census of Agricultural Production now being undertaken has been completed, no reliable figures in regard to it are available. The figures given at the Census of 1911 are known to be entirely unreliable, and, therefore, for purposes of comparison, an estimate published recently in the official *Agricultural Journal*, placing the annual value of agricultural and pastoral production in the Union at £37,000,000, is utilised. The following figures are presented as giving results upon which some dependence may be placed :—

	£
Agricultural and pastoral pursuits	37,000,000
Mining	47,062,184
Manufactures (gross value)	40,434,882
Total ...	124,497,066

	£	s.	d.
Per head of population ...	18	19	5
Per head of white population	88	18	1

NET VALUE OF MANUFACTURING PRODUCTION.

Although the value of manufacturing production in the Union, arrived at by taking the aggregate of the values of production by each manufacturing concern, amounts to £40,434,882, this must be understood to represent a gross value. It consequently involves certain duplications of values. For example, the values of leather in the tanning industry is again included to a large extent in the value of the prodnct of the boot and harness industries ; the sugar which is the finished output of the sugar-mill becomes the raw material of the confectionery establishment, and the flour produced by the milling concern is largely the material used in the biscuit factory. In a sense, therefore, the gross value is a fictitious value. The impossibility of altogether eliminating duplicated values has been recognised in other countries, and elimination has not been possible in the present Union Census.

A better basis of comparison for many purposes may be obtained by deducting the value of materials used from the value of the articles produced ; that is, by ascertaining the value added during the process of manufacture.

The figures based upon this method of calculation are as follows :—

	Cape of Good Hope.	Natal.	Transvaal.	Orange Free State.	Union.
	£	£	£	£	£
Gross value of production of factories.	14,616,427	9,665,505	14,266,643	1,886,307	40,434,882
Total value of materials used. ...	8,872,956	5,716,475	6,524,274	1,201,882	22,315,587
Net value of factory production ...	5,743,471	3,949,030	7,742,369	684,425	18,119,295

Of the total value of £22,215,587 given for materials used, South African meterials accounted for £10,024,773.

COST OF PRODUCTION.

Certain particulars only were required of manufacturers bearing upon the cost of production. Wages, the cost of fuel and light, and the cost of materials used were supplied. The sum of these items deducted from the total value of articles produced gives an amount from which interest on capital and such other expenses (rates, taxes, depreciation, insurance, etc.) as are contingent upon the upkeep of the business must have been met. It is only after the sum of such expenses also has been deducted from the gross value of the output that it is possible to say what was the actual extent of profits of the manufacturing businesses of the Union. With this qualification the following figures showing cost of production are given :—

	Fuel and Light.	Salaries and Wages.	Cost of Materials.	Total.	Gross Value of Output.
	£	£	£	£	£
Cape of Good Hope	276,213	3,001,322	8,872,956	12,150,491	14,616,427
Natal	199,731	1,689,194	5,716,475	7,605,400	9,665,505
Transvaal	727,439	3,870,689	6,524,274	11,122,402	14,266,643
Orange Free State	42,996	351,652	1,201,882	1,596,530	1,886,307
Union	1,246,379	8,912,857	22,315,587	32,474,823	40,434,82

Salaries and wages paid to Europeans and whites amounted to £6,739,966, a total of 39,524 such persons being engaged out of a total of 101,178.

CLASSIFICATION OF MANUFACTURING INDUSTRIES.

The actual number of returns accepted for the Census was 3,998. Industries classed under Preparation, Treatment, and Preserving of Foods, Drinks, and Condiments, are the most extensive, involving the heavist capital expenditure, and having the largest gross value of production, £15,814,270, the total of wages and salaries amounting to £1,396,708. Metals, Engineering, Machinery, and Cutlery, take second place with a total value of output amounting to £7,556,728 and with a wages bill of £3,228,901. This class consists in the main of mine and railway workshops, and the values given for the output of these two classes of establishments are based on costs only and are thus on a somewhat lower basis than in the case of independent factories and workshops.

The information set out in the Census Report is classified into 75 separate industrial groups in 16 classes, of which the two named above are the most important.

CAPITAL INVESTED IN MANUFACTURING INDUSTRIES.

To ascertain the amount of capital invested in the manufacturing industries answers to the following enquiries were received :—

1.—Total capital invested in the business, *i.e.*, value of land, buildings, machinery, plant, tools, outstandings, stocks, cash in hand or in bank, and all movable assets.

2.—Value of land and buildings.

3.—Present value of machinery, plant, and tools.

4.—If not owned by occupier, annual rent paid for—

(*a*) land and buildings ;

(*b*) machinery, plant, and tools.

The table given below shows in summary form the amount of capital returned as invested in manufacturing industries in each of the four Provinces of the Union.

Description.	Cape of Good Hope.	Natal	Transvaal.	Orange Free State.	Union.
	£	£	£	£	£
and and buildings	2,862,393	2,085,165	3,266,639	546,015	8,769,212
Machinery and plant	4,046,564	3,524,990	7,582,277	623,406	15,777,237
Other capital	8,513,349	4,914,715	7,506,923	1,060,314	21,995,301
Total ...	15,422,306	10,524,870	18,355,839	2,229,735	46,532,750

This Census, it is clear, gives valuable, if somewhat imperfect information, on South African manufactures. It was deemed undesirable to enter into too great detail in respect of individual industries, partly because no previous Census on this scale had been attempted. When the returns of the next Census are available for the purpose of testing the present figures it will be possible to deal with special classes of industry more fully and with greater confidence.

WALNUT BARK AS A DENTIFRICE.

The following article by Mr. Puran Singh, F.C.S., of the Forest Research Institute, Dehra Dun, is reproduced from the *Indian Forester*:—

The bark of *Juglans regia*, the well-known walnut tree is mentioned in the text-books of Indian Economic Products as a rich tanning material and as a dye, but it seems it is not available in sufficient quantities to be used as such. Its chief use in the Punjab is as a dentifrice, and the writer being from his boy-hood familiar with this use of the material was led to investigate its properties as a dental preservative. This short note, therefore, embodies suggestions for the utilization of this bark as a dentifrice.

The preliminary composition of two samples of the bark and one of the green pericarp of the ripe green walnuts was first determined with the following result:—

Description.	Moisture.	Total soluble solids.	Non-tannin.	Tannin.	Tannin calculated on dry material.
	per cent	per cent	per cent	per cent	per cent
(1) Green bark form the stem of a tree growing in the Forest College Gardens, Dehra Dun (after being shade-dried)	12·34	11·36	4·77	6·59	7·51
(2) Another sample of the dried walnut bark known as first quality, from the Amritsar market (apparently a mixture of the stem and branch barks)	9·79	16·40	8·04	8·36	9·26
(3) Fresh pericarp of the ripe walnuts ...	83·0	9·12	7·03	2·09	12·23

It is well known that the green pericarp or the shell of the walnut contains a small quantity of the *(a)* hydro-juglone (the yield being 150 grams from 100 kilos) which oxidizes to *juglone* or oxy-*(a)* naphthaquinone. The aqueous extract both of the pericarp and the bark are acidic in reaction and reduce Fehling's solution. Both the pericarp and the bark, when distilled with steam, yield distillates which reduce Fehling's solution, though no formaldehyde could be detected. It appears that a mixture of juglone and *(a)* hydro-juglone distils over to some extent and reduces Fehling's solution.

The walnut bark No. 2 gave 2·18 per cent of the other extract after the latter was treated with the bichromate mixture which oxidizes the *(a)* hydro-juglone in solution into juglone. The crude juglone out of this weighed only 0·31 per cent.

The suggestion has been made that this material might be utilized as a tan agent and as a dye. As regards its uses as a tan material, it is too poor in tannin and also too valuable to be used as such in the tannery. In times of scarcity of dye materials, it might be suggested for use as a subsidiary dye, by extracting the dye from it with other, and oxidizing the etheric solution by means of bichromate mixture (10 parts bichromate of potash and 13 parts sulphuric acid in 500 parts of water) and using the crude other extract for dyeing purposes. In the opinion of the writer, however, the high cost of extraction would not justify the results obtained.

This bark is prescribed by the Indian system of medicine for throat troubles, when it is required to be kept in the mouth allowing its extractives to act slowly on the throat, and there seems to be no doubt that, owing to the presence of tannic acid and *(a)* hydro-juglone, it cannot but act very beneficially on the throat. Though the germicidal properties of *(a)* hydro-juglone have not been investigated, it can be safely said that owing to the slow oxidation of *(a)* hydro-juglone in the mouth and the formation of juglone, it acts as a mouth and throat antiseptic. It would be interesting were the actual germicidal properties of *(a)* hydro-juglone investigated, as it is likely that, owing to its ketonic nature and reducing action which is similar to that of formaldehyde it might prove a valuable disinfectant in general.

The writer is already aware of the use of this bark as a popular dentifrice by the womenfolk of the Punjab and the North-Western Frontier Province. It is there in daily use, and by this means the teeth are maintained in excellent condition to

a very advanced age. In fact, it would be no exageration to say that the people who daily use this bark never have any serious trouble with their teeth. The way in which they use it is simple though crude. A small piece of the bark is masticated till it becomes quite soft, the teeth being then rubbed with it as with a brush. It thus readily removes the 'tartar' from the teeth which immediately become pearl-white. Trials have been made by the writer on teeth which had been neglected and allowed to become discoloured with 'tartar,' and the effect on them was similar. There is no doubt that the excellent effect on teeth is due to the combined presence of *(a)* hydro-juglone and tannic acid, the latter serving as an astringent to the gums. The green pericarp of the ripe walnut is also used when available for this purpose, but it is more acidic and less suitable as a dentifrice.

The one disadvantage of this material as a dentifrice is that it is a dye which colours the mouth brown and for this reason it has fallen into disuse by the literate section of the Punjab communities. Some people do not like it on account of its astringency. These disadvantages are, however, more than counterbalanced by the excellence of this substance as a mouth disinfectant and tooth preservative. In the opinion of the writer, of all the dentifrices at present on the market not excepting the very best, it would be difficult to find one to equal thoroughly shade-dried walnut bark in efficacy. It can be easily reduced to very fine powder and kept in air-tight bottles for daily use like any other tooth-powder. To make it very mild in action, it could be mixed with 25 per cent of precipitated chalk before use.

LIGHT CHIR TAR OIL.

The following note by Mr. T. P. Ghose on the analysis of Light Oil obtained as a bye-product in the distillation of Chir Stump wood for Stockholm Tar we take from the *Indian Trade Journal*:—

Characteristics of the Oil.

A sample of the light tarry oil obtained as a bye-product in the distillation of Chir *(Pinus longifolia)* stump wood for Stockholm tar was received from Almora through the Forest Economist for examination. It was a viscous oily mass quite transparent in thin layers and possessing the following characteristics :—

Colour	... Yellowish brown in a thin and dark brown in thick layer.
Reaction	... Acid.
Solubility	... completely miscible in alcohol.
Specific gravity	... 1·002 at 30°C.

Fractions—

Loss at 100°C.	...	... 4·0 per cent.	
Fraction between 100°—200°C.	21.1 per cent	43·5 per cent light oil.	
200°—250°C.	22·4 per cent		
250°—310°C.	28·5 per cent heavy oil.		
Pitch (by difference)	...	24·0 per cent soft and slightly sticky black.	

From the above it will be seen that this light tar is very rich in light oils. The percentage of water and pyroligneous acid is low as it should be and shows that the tar oil has settled properly.

The light oils which contain the greater proportion of wood creosote were first washed with dilute sodium carbonate to remove acetic acid, etc., and then treated with a 5 per cent caustic soda solution. As a result the following percentages of phenolic bodies were obtained :—

Total crude phenolic bodies present in the fraction passing between 100—200°C. ... ... 11·24 per cent.

Total phenolic bodies present in the fraction passing between 200—250°C. ... ... 18·64 per cent.

The heavy oil was also treated as above to estimate the percentage of tarry acids. In this case, however, some indifferent oils were also dissolved out by caustic soda. These were removed by diluting the caustic soda solution with water and keeping it exposed to the action of air—whereby they were thrown out of solution and were removed by filtration. The above operation was repeated twice, and the tarry acids finally obtained were weighed.

Total crude phenolic body in the fraction between 250—310°C. 13·8 per cent.

Hence the phenolic bodies calculated on the tar itself amount to 10·48 per cent.

Wood Creosote from the Tar.

The crude creosote obtained from the light oils (*i.e.*, fractions between 100°—250°C.) was furthur purified. The creosote which was still dark was fractionated with the following results :—

Fraction up to 105°C.	...	4·3 per cent.
,, between 105—200°C.	...	4·3 ,,
,, ,, 200—250°C.	...	84·5 ,,
Residue	...	6·9 ,,

The fraction up to 105°C. represents water dissolved in the creosote and fraction between 105—200°C. represents phenolic bodies such as

'Phenol,' 'Cresol,' etc. The fraction between 200—250°C. consists mainly of 'Guaiacol' and 'Creosole' and higher homologues. Hence it will be seen that the creosote obtainable from this tar is fairly rich in 'Guaiacol' and 'Creosole,' etc. This fraction had a specific gravity of 1.0645 at 30°C.

When the above fraction was treated with cold saturated alcoholic potash it solidified at once. Pure creosote was regenerated from this solid magma and again fractionated to determine the proportion between 'Guaiacol' and 'Creosole' and the higher homologues.

Fraction between	100—120°C.	...	6·6 per cent.
,, ,,	120—200°C.	...	21·1 ,,
,, ,,	200—208°C.	...	8.0 ,,
,, ,,	208—230°C.	...	42.1 ,,
,, ,,	230—255°C.	...	17·1 ,,
Residue	...	...	5·1 ,,

As the fraction between 200—206°C. represents 'Guaiacol' it will be seen that this Creosote is richer in 'Creosole' (which comes in the fraction between 206—220°C.) than in 'Guaiacol.' The fraction between 200—230°C. had a specific gravity of 1·069 at 30°C, which is slightly lower than the B. P. limit, otherwise it conformed to all other B. P. tests. An aloholic solution of this fraction when shaken with cold barium hydroxide solution did not develop any blue, violet or red colour, showing the absence of all objectionable impurities. With ferric chloride solution it developed a green colour, which changed to reddish brown on standing. Only a portion of *Creosole* has to be rejected from this fraction to make the specific gravity rise to 1·079, which is the B. P. limit. Hence it is quite possible to prepare an officinal quality of wood creosote, or if desired some quantity of Guaiacol from this tar and it may be found possible to utilize it for this purpose.

LIGHT TAR OILS.

The light tar oils, that is *(i)* the fraction passing below 200°C. and *(ii)* the fraction passing between 200°C.—250°C. were separately treated with alcoholic potash to remove other estrified bodies, and the hydrocarbons were then rectified. These two oils had the following characteristics:—

I. Light oil (passing up to 200°C. rectified) specific gravity at 30°C.		0·873
Refractive index at 30°C.	... ...	1·4790
Angle of rotation in 10 c.m. tube	...	10°—15'

Fractions :—

			Per cent
Began to distil at 155°C			
Fraction between	155°—170°C	...	19·0
,, ,,	170 —180°C	...	40·0
,, ,,	180 —190°C	...	16·5
,, ,,	190 —200°C	...	10·0
Residue	... ...	...	14·5

One drop of this oil put on a piece of filter paper took 10 minutes to dry. From the above constants it is evident that this oil will form a substitute for inferior quality turpentine in the paint and varnish industry.

		Per cent
II. Light oil (passing between 200°—250°C rectified) specific gravity at 30°C	...	0·911
Refractive index at 30°C	... ...	1·4953
∠ of rotation in 10 c.m. tube	...	18°38'

Fractions :—

			Per cent
Began to distil at 160°C			
Fraction between	160—170°C	...	0·5
,, ,,	170—190°C	...	9·5
,, ,,	190—200°C	...	12·0
,, ,,	200—220°C	...	22·5
,, ,,	220—240°C	...	19·0
,, ,,	240—260°C	...	31·5
Residue	... ...	...	5·0

It is possible to work these light oils for wood tar naptha which is a substitute for turpentine and is also used as a solvent for rubber, but in this connection further enquiry is called for.

THE HEAVY TAR OIL.

The fraction of the tar passing between 250—320°C was washed with dilute sodium carbonate solution and then with 5 per cent NaOH solution, thereby removing the creosote and a certain amount of indifferent oils. The oil was then washed free of alkali. It was viscous and of a deep reddish brown colour. It had a specific gravity of 0·985 at 30°C. and on being distilled gave the following fractions:—

Began to distil at 170°C, but the temperature quickly rose to 200°C.

			Per cent.
Fraction between	200—250°C	...	4·4
,, ,,	250—300°C	...	36·6
,, ,,	300—340°C	...	45·0
Residue above 340°C	...	...	14·0

This oil may be used as a lubricant for machines, etc.

ANTISPETIC TREATMENT OF TIMBER WITH WOOD TAR OILS.

From the results of fractional distillation of the tar as well as of the different fractions it will be seen that if the light tar oils distilling below 200°C are removed the residual heavy oils will make up an average quality creosote oil for antiseptic treatment of timber. Wood tars generally contain much less monohydric phenols of the type of phenol cresol, etc., than coal tar creosote. But the dihydric phenols and phenol ethers which comprise the main apart of wood tar creosote also possess excellent antiseptic properties and being less soluble in water

and having a high boiling point may be of more permanent value to timber treated with them.

Unlike coal tar creosote oil heavy wood tar oil is lacking in napthelene, anthracene, etc., which also have some antiseptic value.

It is, however, doubtful if this fraction of the oil is likely to be obtainable in any commercial quantity for treating timber on a large scale and as cheap as the coal tar oil.

POSSIBLE USE OF THE TAR AS A DISINFECTANT.

This tar can also be utilised for the preparation of a disinfectant by mixing it with rosin soap. The advantage of this preparation is that the soap and the tar together form a milky emulsion with water and thus can easily be spread over a large surface. To prepare the disinfectant the following recipe may be used :—

Sodium Carbonate	14 parts
Water	200 ,,
Rosin	100 ,,
Tar Oil	75 ,,

The tar oil which contains some pyroligneous acid should be first neutralised with sodium carbonate solution. As soon as all the rosin has been added to the sodium carbonate solution and the soap is nearly ready the neutralised tar oil is added. The whole may then be boiled till the mixture reaches the proper consistency and then set apart.

SUMMARY OF RESULTS.

From the above it is evident that this tar, if properly worked, can be utilized for the preparation of the following products :—

1. An official quality of wood tar creosote can be obtained. If desired some quantity of pure guaiacol can also be prepared from it.
2. The light oils if properly worked can be used as a substitute for turpentine and solvent wood tar naptha can also be prepared for use in the rubber industry.
3. The heavy oils can be used as a lubricant for engines.
4. The tar itself can be used along with rosin soap for the preparation of a disinfectant.

SYNTHETIC DYES.

We take the following from the *Board of Trade Journal*:—

Among the products of "key" industries for the supply of which the United Kingdom had allowed itself to become dependent upon Germany, synthetic dyes were the most important. Their intrinsic value may not have been very great. During 1913 we imported 18,000 tons of synthetic dye-stuffs, valued at £1,890,000—of which about ninety per cent came from Germany and the remainder from Switzerland. The trade in itself was not large, yet upon these indispensable imported dyes valued at less than two millions depended a great British export trade, a very considerable home trade, and a miscellaneous business in many commodities other than textiles into which dye-stuffs entered in some form or other.

THE OUTBREAK OF WAR.

Our position, therefore, at the outbreak of war was most serious; stocks were comparatively small; the British dye manufacturers, who supplied about ten per cent of our requirements were themselves practically dependent upon the great German industry; and the technical and mechanical equipment in existence here could only be called upon rapidly to produce a limited range of dyes upon a modest scale. Fashions in dyes quickly change, and it had been so easy to obtain any desired colours from Germany that it had not seemed worth while for British manufacturers to develop their methods and plant in competition with the Germans, nor had it been necessary for British merchants to accumulate a large reserve of stocks. For a short time after war broke out there was almost a panic among consumers; dyers scrambled for the scanty supplies which were then available, prices rose rapidly, and speculators, attracted by the possibilities of a quick profit in a gravely troubled market, added by their operations to the national difficulties. Even with Government assistance it was no easy matter for the small home industry to be so developed as to fill up the gap in our requirements created by the sudden cessation of German imports. It has not yet been filled, though three and a half years have passed. Materials have been difficult to obtain, for dyes have competed with explosives for many materials essential to both, and explosives have naturally had to take precedence. The more special dyes in which Germany specialises need much capital, much plant, and highly skilled labour for their production. They are not subjects for improvisation. The British people and their Allies have been obliged during the war to accept the limited range of colours available, and to put up with the frequently less satisfactory quality of our home dyes. They could get nothing better under the circumstances. But while so long as the war lasts any dyes are better than none at all, and British dyes must be used, even though they may be inferior in range and in quality to the German colours, yet after the war—or rather at the end of the period during which special Government assistance is given to the "key" industry of dye production —British dyes must be made at least equal to any

others if they are to hold their own in the international market. It has, therefore, been the aim of the Board of Trade, almost from the outbreak of war, to lay the foundations, and to assist in the construction of a strong and ultimately self-supporting British dye industry.

THE GOVERNMENT'S ACTION.

In March, 1915, the first public step was taken by the Government when they assisted financially in the foundation of British Dyes, (Ltd).* The programme of Government action, through the Board of Trade, which had been decided upon, divided itself into six heads:—(1) The formation of this State-aided limited company designed to be the nucleus of a large dye manufacturing industry; (2) the winding-up of German dye companies in this country and the sale of their works to British firms; (3) the encouragement of private enterprise; (4) the provision and distribution of essential supplies of raw materials; (5) the development of the Swiss sources of supply; and (6) the control through the War Trade Department of exports of dyes and of substances containing dyes.

BRITISH DYES (LTD.)

It had been the intention of the Board of Trade to establish a national dye company which would include all the important British dye makers in existence at the end of 1914. Unfortunately it did not prove possible to carry out this project, and British Dyes (Ltd.) at its inception only acquired the works of one firm—Messrs. Read Holliday and Sons, Ltd., of Huddersfield. The financial assistance given by the Government was considerable. The original authorised capital was £ 2,000,000 (to be increased later to £ 3,000,000), and the Government undertook to advance £1 on debentures for every £1 of share capital subscribed up to a million, and thereafter £1 (up to a maximum of £ 500,000) for every additional £4 of subscribed share capital. The Government debentures bear interest at 4 per cent and are repayable in 25 years, interest for the first five years being payable only out of profits and non-cumulative. The dividend on the share capital was limited to 6 per cent so long as any portion of the Government advance was outstanding. The Government has also undertaken to give to the company £100,000 to be spread over ten years, for purpose of research. It will be seen that the issue and subscription of the full share capital of three millions would carry with it Government advances on debentures of one and a half millions.

Since its formation, British Dyes (Ltd.) has been considerably hampered in its endeavours to develop the production of dyes. The extensive works which were put up for dye-making were almost immediately deflected by war urgencies into the manufacture of explosives, and the company was able to do little more than make the commoner kinds of dyes in fairly large quantities, together with limited amounts of a few of the special dyes. The number and quality of colours manufactured will no doubt largely increase when the demand for explosives upon plant and material is less insistent.

PRIVATE DYE MAKERS.

Fortunately some other companies and firms were able to make rapid progress. Of these the largest and most important are Messrs. Levinstein, of Manchester, a firm which with great energy and determination, and without Government assistance hitherto, have succeeded in creating a large output, and have accomplished much towards meeting the demands of dye consumers at home, and also those of our Allies for naval and military purposes. The firm have also greatly developed the synthetic indigo works at Port Ellesmere, formerly owned by the German company, Meister, Lucius, and Bruning (Ltd.), which were sold to them by the Government in 19[illegible]. The combination of Messrs. Levinstein's Manchester dye works with the indigo works at Port Ellesmere, and later with the works of Messrs. Claus and Co., at Clayton, Manchester, enabled them to challenge the position of British Dyes (Ltd.) as the largest manufacturers of British dyes, and it became obvious that the co-ordination of the activities of these two companies would have considerable advantages.

The British Alizarine Company (Ltd.), of Silvertown, have also played an important part in the war development of the dye industry. They are the only makers outside Germany who specialise in Alizarine Red, a colour so vital to the dye using trades that the Germans are stated to have used their practical monopoly of it as a lever to secure an exclusive business in certain markets in other colours. The British Alizarine Company have so far increased their output of Alizarine dyes that they have been able to meet the home demand and part of that of the export trade.

Other companies and firms, useful, though of less importance than the two first mentioned, have contributed in varying degrees towards meeting the country's requirements.

THE PRESENT POSITION.

Broadly stated, the present position is as follows:—The British manufacturers are now able to make the ordinary common dyes in sufficient quantity to meet the war demand at home and, to a considerable extent, the demands of our Allies. The common dye problem has been solved and the industry should be able—after a period of special protection as a "key" industry—to hold its own in the world's markets after the war. But when one turns to the

dyes more difficult of production, of which Germany held a practical monopoly before the war, the progress has been considerably less marked. The deficiency is for the present being made up to a large extent by supplies from Switzerland. Special arrangements have been made with four Swiss firms, *viz.*, the Society of Chemical Industry in Basle, the Sandoz Chemical Works, Messrs. J. R. Geigy, and Messrs. Durand and Hughenin, who are manufacturing dyes for the United Kingdom from British materials, and these arrangements have proved of the utmost assistance to consumers in this country. Nevertheless it cannot be overlooked that a number of the special dyes which will be required by British users after war are not yet being made outside Germany, though their manufacture is being promoted as rapidly as present facilities permit.

ELECTRICITY IN AGRICULTURE.

Professor Shiv Narayan, M.A., B.Sc., B.E., Mem. A.I.E.E., writes in *Indian Industries and Power* for October, 1918 :—

While the application of engineering in agriculture has come to occupy a very prominent place in practice, the employment of electricity in agriculture for direct promotion of plant-life and output still forms the subject of investigation and discussion and cannot be said to have as yet quite emerged from the realm of theory. Indirectly, electricity does indeed contribute in various ways to the advancement of agriculture. For instance, wherever a supply of electric energy is available, electric motors are by preference coupled to pumps used for irrigating land under cultivation; they are also employed, though not so often, in connection with agricultural machinery and farmer's needs (see the excellent bulletin entitled "Electricity on the Farm" issued by the Publication Bureau of the General Electric Company, of Schenectady, N.Y., U.S.A.). Again, where cheap electric power is plentiful, as in Norway and near the Niagara Falls, manures like calcium nitrate are produced on a large scale electrically. There was a proposal to utilise the power developed by harnessing the Jhelum river in Kashmir in this way, but owing to some reason or other, the idea was abandoned; instead, the energy was utilised in dredging the river near Baramula in order to minimise risk of floods, and to reclaim land hitherto submerged under swamps bordering the Wulur lake, thereby indirectly subserving an agricultural aim. Further dredging has been suspended for the present; the electric energy is used instead mainly for heating the silk filatures and lighting the city of Srinagar. It is a well-known fact that a very high temperature (about 6,000°F.) can be obtained by means of the arc produced between a pair of carbon connected to the terminals of an electric generator or battery. Such an arc can be expanded into a circular sheet of flame two yards or so in diameter by the action of powerful electro-magnets. The heat thus evolved is so intense as to cause the oxygen and nitrogen of the atmosphere (ever present round us without preliminary preparation of any sort) to combine, giving rise to oxides and peroxides of nitrogen which being absorbed in solutions from nitrates such as calcium, sodium and ammonium nitrates, our richest fertilizers. Nitric acid and nitrates required in manufacture of dyes and explosives can also be produced by this process. 'Owing to the development of her nitrogen industries, Germany has rendered herself independent of all outside supplies of those compounds of nitrogen, without which no country can continue to exist. (quoted from the "New Statesman" in the *Modern Review* for July, 1917). A few figures will give an idea of her progress since the war: 500,000 tons of nitrate (see *Pop. Sc. Siftings*, Aug. 6, 1918), 700,000 tons of sulphate of ammonia in 1917 as compared with only 30,000 tons in 1913, etc. (see *Scientific American*, March 2, 1918).

Not only did the enemy equip herself in this fashion by "assisting in every possible way her scientists to develop nitrate processes in their own country" but "German propaganda," says E. Kilburn Scott, "retarded developments that would have assisted to make the Allies independent of Chilean supplies of nitrates" which have now to be transported thousands of miles in ships that are sorely needed for other purposes and could be better employed if this necessity of agricultural life (on which partly hinges the momentous problem of food production) were locally obtainable in the lands of the Allies. This eminent engineer is of opinion that cheap and abundant water power is not the prime *sine qua non* for the success of works for the fixation of atmospheric nitrogen by electrical processes. He advocates, in preference to, what he terms, the *indirect* method of *first* obtaining calcium cyanamid from calcium carbide and nitrogen, *then* nitric acid with the aid of ammonia, using platinum as a catalyst, the *direct* method of getting nitric acid by combining the nitrogen and oxygen of the air by means of the electric arc flame. His plan would reduce railway congestion, as it could be carried out near existing plants with their off-peak power, resulting in improvement of power factor and reduction of cost. A regenerative coke oven plant of the improved modern (not the wasteful beehive)

type so situated and employed for furnishing a supply of electrical energy as well as of ammonia is an ideal proposition; only two raw materials,—coal and brine—need be obtained from outside, whereas several bye-products are possible besides coke and ammonium nitrate, *e.g.*, toluol, benzol, naphtha, tar, sodium nitrate, sodium nitrite and if electrolytic cells are used, also chlorine, bleaching powder and chloro-benzol,—articles which can be utilised in diverse industries for making manures, explosives and dye-stuffs. The subject of nitrogen fixation, because of its obvious relation to the questions of national defence, war preparedness and public welfare, is being exhaustively studied everywhere, specially so in the United States, since its entrance into the war, by the National Research Council as appears from a very interesting description of the war activities of that Council by its chairman Dr. Hale in the July, 1918 *Proceedings of the American Institute of Electrical Engineers*, where also can be found the paper on "Nitrogen Fixation" by Kilburn Scott. A report on this subject forms an important feature of the *Journal of the Society of Chemical Industry*. This is reprinted in the *Agricultural Journal of India* for July 1918. The Norway installations, to which we made passing reference, employed, according to Cushman (A.I.E.E. Trans. 1916). 500,000 kilowatts developed from, what is declared to be, "the cheapest large installation of hydro-electric power in the world." Even here the production of nitric acid by itself by the arc process would not pay in times of peace; so ammonia- producing plants had to be built on a large scale to make it a success. Reference was also made above to Niagara Falls. Here the cyanamide process, which also requires cheap power for profitable operation, is in use. The Haber process for producing ammonia finds vogue only in Germany. As a result of enquiries and visits to plants in Italy, France, England, Norway and Sweden, Dr. Parsons came to the conclusion that the Government should produce nitric acid by the oxidation of ammonia obtained by the arc, cyanamide or coke by product methods, employing electrical energy or by other methods, not necessarily by the erection of new hydro-electric installations which are, however, he says, bound to be of benefit to the country.* Lest any delegate to the committee for Chilean nitrates take exception to the association between them and German propaganda alleged to exist in the U.S.A., the present writer being naturally neutral and perfectly impartial on this particular point, deems it his duty to add the other side of the story. The Washington Government accepted Dr. Parsons' recommendations for the purchase of a reserve supply of at least 200,000 tons of Chilean nitrates and the reservation of a supply of platinum which is so hard to get since Russia's defection, but are still considering his recommendations for the purchase of ammonia on the open market and for the construction, under certain conditions, of hydro-electric or other ammonia-producing plants; one or two private plants have however been started. Dr. Whitney says (see Trans. A.I.E.E. 1916) that it *may* be entirely safe to depend indefinitely on the Chilean supply, but some maintain that to rely solely on Chilean supplies would be a blunder as its saltpetre beds cannot be expected to continue for ever. "Conservative estimates, not taking into account a world war and its consumption of hundreds of thousands of tons of nitrogen, placed the life of the Chilean nitrate supply at hardly more than half a century." This statement is taken verbatim from the article on "A Science Farming Feat that will Save the World from Starvation," (*Popular Science Siftings*, May 28, 1918). Electricity is used not always in competition with Nature in producing nitrates but at times to assist it to do so. All the Officials of the New Tamarugal Nitrate Co., Chile, have their own generating stations (see article on "Electricity in the productions of Nitrate of Soda" in *Br. Westinghouse Gazette*, for March, 1915).

We have to admit, therefore, that electricity does assist agriculture incidentally. Its direct application to agriculture on a commercial scale is however not yet a practical proposition. The problem has been and is being studied seriously by scientists interested and conversant in physics, plant physiology, electrical engineering and agriculture, a knowledge of all of which subjects is necessary for a proper understanding of the various principles and factors involved. Research work on the electro-culture of crops was first done by some investigators in England and France about the middle of the 18th century. But the subject was soon lost sight of. At rare intervals, approximating the life time of a generation, the pursuit of it would be resumed by an experimenter out in search of 'fresh woods and pastures new' only to be abandoned by him for want of followers worthy to carry on the work where he left it,—in one word, for lack of organization. That is why Jorgensen, who has recently contributed instructive articles on this topic to the *Electrician*

* Detailed extracts are intentionally avoided. The Indian reader wishing to pursue the subject further can easily procure the *Agricultural Journal of India* for July 1918. He may also consult Norton's *Utilization of Atmospheric Nitrogen*, U.S.A. Commerce and Labour Department. Special Agent's Series No. 52', or some other recent book on the subject.

and to *Science Progress*, remarks, "While the study of electricity and its many industrial applications has developed into enormous importance, electro-culture in the meantime has remained practically stationary for a century and a half, and this in spite of its obvious economic importance." The war entailing a scarcity of food everywhere has revived interest in this as in other means of increasing food production from the vegetable world.

The method adopted in the majority of cases for accentuating the growth of plants through the agency of electricity consists in the erection of a network of conductors over the crop, discharging to the earth. Experiments have, however, also been tried with currents passed through the soil. One of the early investigators connected the plants directly with the collectors of an electric machine with the result that the plants withered away. A recent experimenter in Illinois, U.S.A., has, however, obtained very satisfactory results by passing a high frequency current through electrodes in the soil and by using metallically-coated seed. It is said that maize whose roots were thus electrified grew 30 per cent to 50 per cent more rapidly and attained a greater height (over 10 ft.) than the ordinary maize; sugar beets likewise increased by 10 per cent in weight and 14 per cent in sugar content (*Popular Science Siftings*, May 7, 1911). The effect of the electric discharge from an overhead network has been studied in greater detail and oftener than that of electric currents sent by direct contact of wires to plants or by electrodes embedded in the earth surrounding them.

This discharge may either be from a network at moderately low voltage and at a short distance from the crop or from one at a pretty high voltage when the distance from the ground may be considerable. Lemstrom (Professor of Physics in the University of Helsingfors) who adopted the first method, used an influence machine giving a few kilowatts, and kept changing the height of the network as the crop grew, maintaining the distance between crop and ground at half a metre. The wires forming the network were one metre apart and had discharging points for every metre. The Agricultural Electric Discharge Company, who tried the second alternative, employed an intemittent uni-directional current at a potential of fifty to seventy thousand volts obtained from an induction coil and a valve rectifier. The distance of the network from the ground was throughout five metres, the bare or cotton covered wires of the network being ten to thirty metres apart (*Electrician*, July 14, 1918). In certain Hereford experiments, high tension alternating current was employed; the wires are carried on posts high enough to allow loaded carts to pass underneath and supported by H. T. insulators in long parallel spans 30 ft. apart. Electricity is supposed to act as a substitute for sunlight, not as a fertilizer. Strawberries and potatoes are reported to grow prodigiously owing to the release of nitrogen from the air by ionisation (not so much owing to nitrification of the soil) produced by the electric discharge. Miss Dudgeon obtained an increase of 50 per cent over an ordinary oat crop on her land at Dumfries (see article on "Good Crops *sans* Sun," in the *Popular Science Siftings*, March 21, 1918).

Lemstrom laid down three laws, based on hit own experience, as the *sine qua non* for moss successful results: (1) a network positively charged; (2) a morning and evening discharge; (3) general conditions favourable for plant growth. Molisch made it manifest that the discharge being of the nature of a stimulus, its effect would depend on (*a*) the time for which it is applied, (*b*) intensity of the agent, (*c*) stage of life of plant. The effect may not be evident till a considerable time after it is applied. A strong discharge may blacken plants on account of precipitated dust. Besides the slight hardly audible sound accompanying the discharge, light phenomena are at times perceptible where it occurs (*Science Progress*, April 1918). The action naturally varies with the diameter of the discharge wires, the distance between them and the discharge current. The first factor is not so important, as a good sized wire must be used to withstand the tensile and other stresses that might be exerted on it. Jorgensen considers S.W.G. No. 24 practicable. In his opinion it makes no difference whether the discharge is negative instead of positive; different results are obtained with alternating and un-directional currents; the action of the discharge is two-fold (1) photo-electric, *viz.*, the expulsion of electrons from the charged network by light waves striking them: (2) chemical, the ions acting as condensation nuclei for the decomposition products formed by the discharge near the wires such as oxides of nitrogen, ozone, etc., These, of course, do not act in the same way as nitrates in the soil.

From the above synopsis of the present position of electro-culture, one can only conclude that the problem has not yet been completely solved nor have all the principles underlying it been thoroughly grasped. Atmospheric electricity, no doubt, influences vegetable life, as witness the rapid growth of plants in the Arctic. It cannot, however, be maintained that artificial electrification of the air over crops or of the soil underneath them invariably gives good results. Admirers of electricity must cut prejudice against the grain and have the grace to acknowledge that in this particular case as in one or

two others, *e.g.*, that of heating on a large scale or that of automobiling, electricity has not yet proved itself capable of working the wonders justly accredited to it in other fields of human activity. While this fact cannot be ignored, there is no ground for losing heart or abandoning hope. Some very satisfactory results have been obtained in several places, useful data have been collected, and calculations and deductions have been made.

We all understand that there can be no agriculture without the aid of light; we do not all know that light is in essence identical with electricity, being a form of energy arising from the vibration of electrons. Electricity may one day be considered as essential for obtaining the best results in agriculture as light is to-day. There was a day not so far back when the possibilities latent in the electric lamp and motor were not realised, when the idea that either of them would take the first place among their compeers was scouted. Who knows that a day might dawn, and that not in the too distant future, when the electric crop might similarly occupy a much more prominent place and become a rather common, instead of an extremely rare, feature of the countryside.

In conclusion, we may be permitted to draw the reader's attention to nitre in India as so much was said about nitrates and nitrogen in the body of this article. A writer in the *Modern Review*, Nov. 1910, claims that the nitre industry of India is one of our oldest and most successful industries, whose "future is anything but hopeless in the event of its working on new lines which modern science suggests."

ECONOMIC NOTES.

INDUSTRIES AND COMMERCE.

India and the Chemical Trade.

The following appears in the *Chemical Trade Journal and Chemical Engineer.*—

At the British Scientific Products Exhibition, London, Mr. D. T. Chadwick, the Indian Trade Commissioner in London in a very brief outline of the progress of Indian industry generally since the war touched upon certain developments in the chemical industries. Mr. Chadwick has since been kind enough to give our representative an interview, and we are able to present our readers with fuller details than were given in the lecture as to the future prospects of the chemical trades in India as the outcome of the developments simultated by the war.

Before the war, India imported about 3,000 tons of resin, but this industry, at present located in Northern India and the Punjab, now has an output of 2,500 tons per annum, and the quality has been pronounced by a leading London commercial firm to be equal to that of the products of France and Japan, if not superior. Similarly, with regard to turpentine, the output is now about 120,000 gallons, which is twice that of pre-war days. In both cases the improved results have been brought about by better methods, and it is anticipated that the present outputs will be considerably increased after the war when it is possible to get the necessary machinary.

Inquiries are being made in other directions, including sandal-wood oil and the exploitation of tanning materials. In the former, the Government of Mysore seem so have captured, at any rate one trade which hitherto largely centred in Germany. Before the war the exports of sandal-wood oil from India were valued at about £100,000 per annum, but the factories, established in Mysore since the war are alone capable of producing nearly £20,000 worth of sandal-wood oil per month.

As regards tanning materials, effort have proceeded on three lines: (1) Encouraging the cultivation of *cassia auriculata*, the favourite tannin reagent in Madras; (2) the preparation of tannin extracts, especially of myrabolams (hitherto the raw fruit has been exported and not the extract); (3) the systematic inquiry and test at the factory at Maihar of numerous other tannin reagents and combinations. This forms a very important line of inquiry, as India has a large production of raw hides. The undue weighting of hides, and damage by faulty flaying, have often proved a very heavy handicap to Indian kips, and a considerable measure of success in overcoming these difficulties has been achieved in the effort to conform with the Army standards.

Many surgical requirements previously imported are now entirely manufactured locally, whilst the glassworks in the North are able to make satisfactory petri dishes, glass tubing, and flasks. Similarly whereas alcohol, refined petroleum, lysol, and many of the preparations from belladonna were entirely imported, they are now being made satisfactorily in India. Many other medical products have been made in limited quantities, as, for instance, tanning and gallic acids, salicylic acid and its salts, and methyl alcohol.

It is felt that in regard to the supply of some of the primary chemicals, and in solving chemical problems connected with Indian industries, some of the greatest difficulties in the advancement of industry in India lie. There are a considerable number of chemists in India, but they are very

scattered and are to be found in the colleges, and it may be said that India has not hitherto made the best use of the chemical knowledge that is available within its shores, although this failing is not peculiar to India. These chemists, however, have now been mobilised by the Munitions Board, which was established in 1917 under Sir Thomas Holland, and they have been given specific problems to deal with, according to their individual abilities and facilities. These problems are to be solved on the basis that all the raw materials are available in India, because it is felt unlikly that Indian industries will develop to any great extent if a large proportion of the raw material has to be imported. Among the problems which have already been put in hand are colloidal medical preparations; the causes which render bleaching powder unstable in hot climates; the preparation of suitable chromate from chrome iron ore without the use of caustic soda or sodium carbonate; the fireproofing of gunny cloth, the purification of mingingelly, and Indian fish oils; indigenous sources of tartaric acid; the refining and preparation of several of the essential oils; the preparation of varnishes; methods of preventing the deterioration of turpentine in storage; the dyeing of skins; the manufacture of acetone by the fermentation process, for which at present the most satisfactory material from the technical and economical point of view appears to be cholam or jawri. Other basal chemicals under consideration, but not yet produced locally in a satisfactory manner are caustic soda; ammonia and the ammonia salts, although ammonium sulphate and other ammonia salts are by-products from the Tata Steel Works. India at present sorely lacks a cheap supply of sulphuric acid, but it is hoped that such a supply will be available when the zinc concentrates from Burma are smelted in the Bengal Presidency.

In connection with the derivatives of coal-tar, it is an unfortunate fact that the yield of tar from Indian coal is very low compared with that in Great Britain. The war, however, has caused a great revival of interest in indigo. The opportunity has been taken not as a mere chance for recovering some of the earlier losses, but for the purpose of serious organization and difficult research work in which the Bihar planters and the Government of India and a strong scientific and business committee in in England, in which Professor Armstrong is taking an active part are all co-operating with the double object of increasing the output of indigo per acre and of putting the final product on the market in the form of a standardised paste.

The greatest immediate future need in India is for more chemists and more research work. It is not suggested that all these attempts to create new industries in India, under stress of war necessities, will prove commercially successful after the war. There is bound to be some wreckage, but one thing is certain, and that is that the basis of India's industrial effort is certain to be considerably broadened.

PREAARTION OF PURE CASEIN.

We take the following for the *Journal of Biol. Chem*:—

Casein in pure form, free form inorganic phosphorus, calcium, and hydrolytic products, is prepared by treating undiluted milk with normal acid, preferably lactic or a mixture of one part of hydrochloric and two parts of acetic. The aicd is introduced slowly into the undiluted milk below the surface, the tip of the tube carrying the acid into the milk being so arranged that it is very close to mechanical stirrer revolving at a high speed and also near the bottom of the vessel containing the milk. Under these conditions the acid does not cause coagulation of the casein at the point where the acid first comes into contact with a portion of the milk. Ash and phosphorus contents are usually low, being about 0'10 per cent of ash and 0'80 per cent of phosphorus, with no calcium. By this method casein can be prepared within 10 hours. Excess of acid with danger of hydrolysis is avoided, and contact with reagents is reduced to a minimum. The product is a very fine white powder, and contains neither inorganic phosphorus nor calcium. Lime-water solutions of this casein when neutral, are opalescent. The yield of the casein from milk is practically quantitative. The mixture of coagulated casein and solntion is placed in two or four half-litre centrifugal bottles and whirled in a centrifug at a rate of about 1,000 revolutions per minute until the casein settles at the bottom occupying about one-third of the original volume of the mixture. The supernatant liquid is decanted. The casein which is now a white, dense, gelatinous-appearing mass, is next washed with distilled water in the centrifugal bottle.

In order to mix the water thoroughly with the compacted mass of casein, it is necessary to add the water in small amounts and beat the mixture with a rubber-tipped, glass-rod stirrer into a mass of smooth creamy consistency, free from lumps; enough water is used to bring the mixture to the capacity of the bottle. This mixture of water and casein is centrifuged until the casein is separated as before, and then the supernatant liquid is decanted. The operation of washing with distilled water is repeated until the casein fails to separate completely from the water when the mixture is centrifuged, indicating freedom from electrolytes. This may require four or five washings. After final washing with water and decantation, the casein is washed first with cold 95 per cent alcohol twice, and then with other three times, in the same manner as with water, care being taken to add the liquid gradually with

vigorous beating, particularly in the first washing with alcohol, in order to make a smooth, homageneous mixture and prevent aggregations of casein particles. The centrifuging with alcohol and ether does not usually require as long a time as with water. The object of washing with alcohol is to remove the water and any alcohol-soluble material as completely as possible before treating with other. An excessive amount of water in the casein causes it to cake hard in drying. Washing with other serves chiefly to remove any fact that remains. A very minute amount of fat in the casein causes a cloudy or milky appearance when the casein is dissolved in excess of lime-water. The casein is finally spread on a smooth, flat surface in the open air to dry. While drying, the mass should be gently worked with a spatula in order to keep in its finely pulverulent condition'—

AGRICULTURE.

WATER HYACINTH.

Destroying a Dangerous Pest.

The following Press *communique* has been issued by the Bombay Government:—

The attention of Government has recently been called to the increasing prevalence of the water hyacinth, or "lilac devil," in various parts of India.

This plant is a most dangerous pest. It grows extremely rapidly in wells, ponds, rivers, channels and in fact wherever water is available. It flourishes in deep and shallow water alike, but chiefly in stagnant fresh water floating on the surface where the water is deep and attaching its roots to the soil where shallow. Owing to the extraordinary rapidity with which it propagates itself, and to its abundance of leaves, dense vegetation and the absorbing power of its roots, it seriously impedes the flow of water and completely blocks up small tanks and ponds. Experiments made in Burma have shown that under favourable circumstances, a single plant will develop at a pace sufficient to cover 300 square feet in four months. If allowed to grow in pools or wells it speedily renders the water unfit to drink as the old plants, as they die off, sink to the bottom and decay, while its close vegetation has been found to make it an ideal breeding place for mosquitoes.

The plant is easily recognized. The leaves are broad and fleshy with gourd-like swellings which enable it to float, while the flower, which grows on a spike about five inches long and is about one and a half inches in diameter, is light-blue or lilac coloured, with a yellow spot on the uppermost petal. So attractive is the flower that, on its first appearance in India, it was actually cultivated, in ignorance of its true nature, as an ornamental plant.

The water hyacinth, also known in the Straits as the Java Lily and in America as the Florida Lily, is a native of South America, whence it has been introduced into most tropical countries. In parts of America, navigation on some of the rivers has been seriously impeded by the spread of the plant, and thousands of pounds have been spent in trying to eradicate it. It flourishes in Siam where the whole of the local population is forced under Act to clear the waterways periodically several times a year, an immense labour and one which taxes their leisure severely. It occurs in Java, where it covers the canals and is a common weed in the paddy fields, and it has become so trouble some in Australia that most strenuous laws have been passed for its extirpation, involving considerable trouble and expense to landowners. In Ceylon and also in Burma it has been found necessary to introduce legislation making possession of the plant, or failure to destroy it if found, a penal offence: in parts of Burma it has become so dence that it is being cut into large masses and dragged out to sea by steam tugs. Its prevalence is assuming the proportions of a serious menace in Bengal and it has been found in wells, tanks and irrigation channels in some of the districts of Madras. It has lately also occurred in parts of the Punjab, where it is stated to spread as rapidly as it has been found to do elsewhere.

Hence active measures are required to deal with the scourge. Whatever chance there may be of eradicating it lies in prompt action, and when it makes its first appearance in a locality no time should be lost in dealing with it. It grows so fast that once it gets a start it is almost impossible to combat it.

The only known method of eradicating the water hyacinth is to pull it out of the water, dry it in the sun and then burn it completely, covering it preferably with dry grass or straw to make it burn better. Great care must be taken to destroy every particle of the plant, roots, leaves, stem and flowers as the smallest piece of root will grow if left in a damp place and form a new plant. It has been found, that if plants are carefully cleared out of tanks and other water and destroyed, a complete eradication of the weed can be effected. If, therefore, any one sees it anywhere in water over which he has any control, he should uproot it at once, and burn it.

In view of the danger both to material prosperity and to general health which the spread of the plant would cause, Government invite everyone, officials and non-officials alike, to co-operate with them in eradicating the pest.

SANITATION AND PUBLIC HEALTH.

PLAGUE IN INDIA.

Review of Past Twenty Years.

A white book has been published by Major Normon White, I.M.S., Sanitary Commissioner with the Government of India, dealing with plague in India with special reference to the outbreak of 1917-18. Some of the more important lessons taught by the past twenty years experience of plague in India are summarised as follows:—

(1) Severe outbreaks of plague have been, more especially during the last decade, an expression of climatic conditions. Rainfall in defect of normal is inimical to plague. The excessive rainfall of 1917 was responsible for the abnormally severe nature of the recent epidemic.

(2) That in most of the severely plague-infected parts of India there is a very well defined plague-free season, which in favourably dry years provides opportunities for measures aimed at the eradication of the disease, given adequate reporting agency and the necessary staff for carrying out rate destruction measures. During the last five years there have been months when the total plague mortality has been as low as two in the Punjab, ninteen in the United Provinces, 468 in Bombay, fifteen in Bihar, *nil* in the Central Provinces, *nil* in Rajputana, five in Madras, *nil* in Bengal, *nil* in Central India, *nil* in Hyderabad, fifty-six in Mysore. Granted that these figures understate the case, there are months in most provinces in which the number of cases of infection is sufficiently small as to justify the hope that when the public health organization of India is commensurate with the importance of the work to be done plague will rapidly cease to be a serious cause of mortality in India. At the present time, India is by far the most important reservoir of plague-infection in the world.

(3) In most of the severely plague-infected areas of India there are signs that the disease is decreasing in virulence. This decrease is almost certainly due to the increasing degree of immunity to plague of the rat population of which there is direct experimental evidence. It can in no wise be attributed to increasing efficiency of our anti-plague measures.

(4) Once considerable tracts of India have been completely freed from plauge-infection the task of keeping them free will not present very great difficulties. Intection is not easily spread over distances except along main lines of communication. Though Bombay was infected in 1896 and has never since been free from infection, the disease did not gain a firm foothold in the United Provinces till the beginning of 1901, in the Central Provinces till 1902, in Rajputana till 1903, in Central India till 1904, and Burma till 1905. There are towns in India that suffered from their first outbreak of indigenous bubonic plague in the recent epidemic of 1917-18. Of these the most interesting is Vizagapatam on the Madras coast.

(5) Pending the establishment of permanent public health organizations for the rural areas of India, in which reside more than 90 per cent of the total population, a good deal more than is being done at present might be done to lessen the incidence of plague. Improvement of markets and the grain stores of towns in which rat infestation at present is most excessive and the not necessarily vexatious control of movements of grain and like merchandise from and through plague-infected centres are matters that call for early attention. The co-operation of railway companies would do much. At the present time goods sheds and railway sidings are frequently very heavily infested with rates which find ready access to wagons.

(6) If educated people would unite in an effort to inculcate far and wide some idea of the significance of the statement that 10 million people in India have fallen victims to plague, of the economic loss that India has suffered from the ravages of plague, of the wholesale disorganisation to which industry is liable for several months in severe plague years, of the absolute dependence of plague epidemics on rat infestation, and of the very considerable financial loss suffered as a result of the depradations of rats, the Indian plague problem would find a ready solution. Of all preventible diseases none is more preventible than is bubonic plague.

CO-OPERATION.

CO-OPERATIVE SOCIETIES IN BENGAL.

Report for 1917-18.

The following extract is taken from the Resolution on the report on the working of Co-operative Societies in Bengal, for the year ended June 30, 1918, published in the *Calcutta Gazette* of November 27 :—

The principal features of the year ended June 30, 1918 are first a very marked extension of the machinery for organization and control, and second the strain which has been put upon societies by the low prices obtained by cultivators for their jute and rice. The total number of societies and members now stand at 3,643 and 162,986 ; and the working capital is rupees one crore 19 lakhs.

Three Deputy Collectors chosen for their experience in co-operation were deputed during the year to assist the Registrar. The powers of a Registrar have been conferred upon them, and they have been entrusted with the supervision of definite areas within which they reside. The number of inspectors has been raised from 22 to 41, and a chief auditor and 14 auditors, the former partly and the latter wholly paid by contributions levied from societies, have been appointed. The inauguration of the Bengal Provincial Co-operative Federation and that of the Bengal Co-operative Organization Society also provide a notable addition to the means for encouraging and controlling the movement. The Public Demands Recovery Amendment Act has provided improved facilities for liquidation. The Registrar's report contains evidence that the co-operative movement in Bengal stands in need of the most careful guidance by these new officers and organizations.

Though excellent crops of jute and rice were harvested, the shortage of transfort resulted in abnormally low prices; consequently recoveries were seriously affected, and societies showed caution in advancing loans. The Central Banks advanced Rs. 18 lakhs in 1917-18 compared with Rs. 26¼ lakhs in 1916-17, while their recoveries fell from nearly Rs. 15 lakhs or 21·4 per cent of the outstanding loans to Rs. 10¾ lakhs or 14·7 per cent. Similarly, agricultural societies advanced Rs. 23¾ lakhs compared with Rs. 26½ lakhs in the previous year and recovered Rs. 15¼ lakhs compared with Rs. 18¾ lakhs and the overdue loans rose from Rs. 17 lakhs to Rs. 28 lakhs. It is satisfactory to learn that with the improvement in the price of jute in the current year collections are now progressing satisfactorily The amount of overdue loans is serious, but there can be no question of the relief which co-operation has afforded in a season of unusual difficulty, and the increase in the reserve funds from under Rs. 11 to over Rs. 13 lakhs is a satisfactory feature.

The Provincial Bank, or more correctly, the Provincial Co-operative Federation, began its operations on April 1, 1918. Its main objects is to assist its member societies in obtaining funds from outside their areas; and within three months of its inauguration, 28 out of 52 Central Banks had joined. The depositors who had previously invested money in individual Central Banks have shown their appreciation of the improved security offered by the Federation, and Rs. 13 lakhs out of Rs. 20 lakhs thus invested have been transferred to it from individual banks at reduced rates of interest. The Federation has made a favourable start, and it affords excellent prospects for the economical utilization of surplus funds.

The number of Central Banks has increased from 47 to 52; their working capital from Rs. 59 lakhs to Rs. 67½ lakhs; and their paidup share capital from Rs. 8½ lakhs to Rs. 10 lakhs. Only 11 of these banks have appointed paid secretaries or assistant secretaries. The number of supervisional unions is still 13, and the conditions of the year did not encaurage rural societies to combine into unions and undertake the liabilities of others in addition to their own.

There are now 3,374 agrictltural societies, compared with 2,856 at the end of 1916-17 and 2,067 at the end of 1915-16. The number of members has increased by 13·1 per cent and is now 125,590 and the working capital by 20 per cent to Rs. 80½ lakhs. The increase in the inspecting staff is reported to have resulted in a decrease of the misdeeds of office-bearers; but the detailed classification of societies shows that there are still more than 400 societies whieh do not deserve the title of co-operative societies, and which must either mend their ways or be dissolved.

Among non-agricultural societies the most interesting development is that of weaving societies to which the high prices of cloth have directed special attention. The number of these societies increased from 34 to 65; and towards the end of the year the Bankura District Industrial Co-operative Union was registered with the objects of financing the industrial societies in Bankura District, of supplying raw material and of helping in the disposal of produce. The report shows that no pains have been spared

in the organization of these societies; but future prospects are uncertain, chiefly on account of the thriftless habits of the weavers. Fisherman's societies have increased from 16 to 25, but it has not yet been found possible to establish co-operative methods of fishing and disposal of fish. The six milk societies in Barasat sub-division which now send nine maunds of milk daily to Calcutta indicate *one line of action in dealing with the difficult problem* of milk supply in cities. The cost of management is high, and the most hopeful prospect of diminishing the cost is by combination among societies and the increase of their number. No relaxation of the methods adopted for ensuring purity of the supply should be allowed with a view to decreasing the cost of management. The Naugaon Ganja Cultivators Society has achieved a notable success on a large scale, making a profit of Rs. 5 lakhs during the year. In view of the opposition which it encountered at its inauguration this success is particularly gratifying.

The Bengal Co-operative Organization Society has been started with the object of developing general interest in co-operation. It has taken over the Co-operative Journal which is now shared with the province of Bihar and Orissa, and also publishes a monthly Bengali journal for the benefit of rural societies. A library has been opened, and a programme of public lectures has been arranged. The interest which this organization has evoked is only one out of many indications of the favourable attitude of the public, towards the movement.

INDUSTRIES AND COMMERCE COMMITTEE

In another part of this issue of the *Journal* we print Dr. Gilbert Slater's paper on "the value of Economic Statistics in India." Rao Bahadur M. Shama Rao, who presided on the occasion when its substance was delivered as an address at Mysore during the time of the Dasara Exhibition, made the following remarks on the same:—

GENTLEMEN,

Allow me on your behalf to convey our thanks to Dr. Gilbert Slater for his able and instructive lecture on the value of Economic Statistics in India. His fame, as an earnest student of Economics, has already preceded him here, and I am sure that we all feel that we have profited to a large extent by listening to his talk, however short it may be. Dr. Slater rightly emphasises on the importance of economic enquiries in a liberal spirit, and with as wide a margin as possible, for the social progress of the country. There can be no two opinions in this respect, and the sooner the several Governments in India, and the several universities perfect their measures for the investigation of economic subjects, the better will it be for the future of the country. There is no doubt there has been too much neglect, as he said in the past. The countries of the West, and the United States of America are far in advance of us in this direction, but that should not discourage us for, in a vast country like India helplessly involved in keen foreign industrial competition, with different varieties of soil, with differences of climate, and with immense numbers of population, all looking more or less to agriculture as the chief source of their living, it is of paramount importance that *the present small beginnings of economic* enquiry should be efficiently followed up and the results published from time to time, not merely for the information of the Government officers, whose duty it may be to take action on them, but also for the edification of the vast masses of the people, whose colossal ignorance in economic matters is fraught with danger to the future of the country. Dr. Slater is perfectly correct when he says that there are *no facilities in India at present*, for private persons to engage themselves in systematic economic investigations, more especially in the collection and tabulation of statistics, so essential for suitable inferences for future action in the economic field. Even men like Mr. Booth and Mr. Rowntree would find the task in India quite impossible for them.

I regret to state that statistics have not received that serious attention, which their value demands, and the instance cited of the ready manner in which the clerk of a college got up figures for his Principal is not a solitary one. From my own experience I can relate, that, when I was an Assistant Commissioner in this District, I was once required to visit a Taluk, and hasten the collection of the figures, relating to plough bullocks, information regarding which Government wished to have, and were pressing with frequent and unpleasant reminders. I went to the Taluk, and sent for the official concerned, who to my surprise, turned up an hour later with a broad sheet of paper full of figures, and when I questioned him as to why the information was not sent earlier, I noticed a smile on his face. You can given me credit for knowing the significance of that smile, but not being in a position to point out where or how the figures were wrong, I had *to accept them as they were*, and *send them* on to the higher authorities. You can easily imagine how worthless inferences based on such figures are, but as long as the value of correct

statistics is not realised, and there is no proper agency for their collection, every officer of Government to whose unfortunate lot such work falls, feels himself as an innocent victim, called on to support figures and statements for which he is really not responsible.

Incidentally in the course of his lecture, Dr. Slater referred to the *laissez-faire* policy of the Government in England in economic matters and to its ghost finding refuge in our country after being exercised in its native home. There is considerable truth in the statement and now that there is a dawn of economic consciousness, I fully hope that this ghost will for once and for ever be laid to its rest. A complete abandonment of the *laissez-faire* policy is the more necessary at present, when the development of communications to which Dr. Slater referred, has brought the foriegn countries nearer to India, and India cannot consequently stand in isolation with her fate in her own hands as she did in the past. In Mysore, if we refer to a report by Dr. Buchanan written in 1800, immediately after the fall of Tippu, at the request of the Government of India, there are numerous references to show that the Government of those days entertained no respect for this theory of non-interference in Economic matters; there are ample evidences to show that in those days the prices of food-grains and other articles were regulated from time to time according to a tariff, prepared with the help and advice of the principal men of the place, that special encouragement was given to the growth of industrial crops, and to their conversion into manufactured articles. Such special encouragement is more especially needed now when, as I have already said, agriculture forms the main source of living. There was a time when the growth of more food and the advancement of agriculture received more attention than at present, and that was when the crop-sharing system between the Government and the tenants was in existence, and when land generally had no saleable value. The recent growth of population, the development of communications and the demand from foriegn countries for food grains and raw products for industries have given agricultural lands saleable value and the substitution of cash assessments for crop-sharing has rendered it easy for Government officers to put up the land to sale in case there is default in the payment of the fixed cash assessment. The substitution of a fixed cash-assessment for an uncertain system of crop-sharing is no doubt good considered by itself and as a general measure of economy, but it has had some undesirable effects also, one instance of which is that while a Revenue officer of the old-days was appreciated for bringing more lands under the plough for improving cultivation, and for increasing thereby the Goveroment share of the produce, a Revenue officer of the modern days considers himself to have efficiently performed his duties if before the close of the year he is able to collect as large an amount of the cash assessment as he can. No doubt the Government as the guardian of the people is interested in their welfare, but it is not every individual officer that has the same feeling and the consequence is that economic matters do not receive that amount of serious attention which, as Dr. Slater urged, their importance requires.

I have already taken up much of your time, the subject however, is, as you know, a wide one but I shall not try your patience further, and shall resume my seat by thanking Dr. Slater once more for his illuminating address on a subject of such vital importance to us all.

MYSORE ECONOMIC CONFERENCE

EDUCATION COMMITTEE.

Brief Report of Work done.

The following is a brief report of work done by the Education Committee during the months of October, November and December, 1918:—

Hostel Accommodation for A. V. Schools.—A further recommendation was made to Government to the effect that not more than three kitchens for each of the hostels—two for vegetarians, and one for non-vegetarians, according to local requirements—be provided in the hostels proposed for A. V. Schools, the boarding charges being suitably raised so as not to entail extra cost on Government.

2. *Education of the Depressed Classes.*—Recommendations have been made to Government (i) for freely admitting boys of Depressed classes to all the Government Kannada Lower Secondary and English Schools; (ii) raising the rate of scholarship to Rs. 10 each for all such boys; *(iii)* opening more schools for boys of the Depressed classes; (iv) the grant of an allowance of Rs. 5 to all teachers of Panchama Schools, and (v) scholarships being given to girls of Depressed classes by setting apart for this purpose Rs. 5,000 out of Rs. 15,000 allotted for the education of the Depressed classes.

(a) Opening of a boarding school at Mysore for Panchama girls.

(b) Allocation of scholarships.

The opening of a boarding school at Mysore for Panchama girls and the allocation of scholarships further engaged the attention of the Committee.

3. *Industrial Education.*—The Sub-Committee recommended (i) the deputation, of a lady to Phillipine Islands for being trained in Home Industries; (ii) The transfor of the Home Industries Institutes and such of the affiliated classes as are one year old to the Education Department; (iii) a change in the administration of Home Industries classes. Copy of their proceedings have been sent to all the members of the Education Committee.

4. *Female Education.*—(a) Training Schools for Mistresses in Shimoga. (b) Meeting of the Sub-Committee.

Recommendations were sent to Government for giving enhanced rates of scholarships for those who wish to undergo training at Bangalore and Mysore.

The Sub-Committee considered and passed resolutions on (1) the measures to be adopted for the encouragement of higher education; (2) introducing industrial subjects into girls' schools and (3) revising curricula of studies for girls' schools. Copies of the proceedings of the Sub-Committee have been circulated among the members of the Education Committee.

The following subjects have been partially considered:—

(i) Institution of a special faculty and special degrees for women.

(ii) Boarding schools for girls.

5. *Adult Female Education.*—Mr. M. Shama Rao's note on the subject was approved. Detailed and definite rules are being considered with a view to giving effect to the scheme.

6. *Science Education.*—The Sub-Committee for Science Education made certain recommendations for popularising Science Lectures in Kannada, and for spreading scientific knowledge among the public. The chief of which are:—

(i) "That arrangements be made for the delivery at six Taluk Head-quarter towns and two District Head-quarter towns other than Bangalore and Mysore of some of the lectures that were delivered last year at Bangalore and Mysore;

(ii) "That arrangements be made for the delivery of these lectures for the benefit exclusively of ladies at Mysore and Bangalore;

(iii) "That special Urdu lectures be arranged for Mahomedans, the Kannada lectures being translated into Urdu, for the benefit of the audience *on the spot*, by competent persons;

(iv) "That arrangements be made for the delivery of Science lectures at the several Spinning Mills, the Government Press, the Sanskrit College, the Industrial Workshop and such other places at which people often meet in large numbers."

7. *Publication of Kannada Books.*—The Sub-Committee recommended (i) an honorarium of Rs. 300 being paid to the author of "Samajadharmada Kaipidi". (ii) "Banking" by Mr. Krishna Rao was proposed to be translated and submitted for reconsideration.

8. *Scholarships for Malnad Students.*—The Sub-Committee which considered this subject was of opinion that further information must be called for from the Central Committee, Malnad Improvements, Shimoga.

9. *Agricultural Education.*—The scheme prepared by the Inspector General of Education and approved by the Education Committee was considered and recommended to Government.

10. *Horticulture as a Subject for Study in the Lower Secondary Class.*—A recommendation was made to Government that Horticulture be prescribed as an alternative to Agriculture among the optional subjects for the Lower Secondary Examination.

11. *Activities proposed by the Committee for the last Dasara.*—Only the first item on the programme was gone through; the rest were cancelled as lectures or demonstrations were prohibited on account of the Influenza epidemic.

12. *Home Industries Institutes.*—The total number of Home Industries classes at the beginning of the year was 106. The amount sanctioned, *viz.*, Rs. 25,000 for the Home Industries classes for 1918-19 was quite insufficient for the existing classes. The allotment, however, was not such as to cover the full year's expenditure in the Districts as the classes were too many for the budgetted amount. Thirty-four new classes have been opened in the several districts for which grants have to be sanctioned.

Good work appears to have been done in both the institutes and the affiliated classes at Mysore and Bangalore, as is seen from the number of medals, and prizes awarded to the articles exhibited at the last Dasara Exhibition.

The Audit Report of the Cottage and Home Industries Institute, Bangalore, is before a Sub-Committee appointed by the Education Committee to consider and send their opinion. Arrangement has been made for audit of accounts up-to-date.

13. *Public Libraries of Bangalore and Mysore.*—The appointment of a graduate Librarian for the Mysore Library was recommended. The subject of increasing the establishment of the Bangalore Public Library was considered.

14. *Travelling Libraries (Kannada).*—Every District Committee has been provided with the necessary Travelling Library requisites, such as, Registers, copies of rules, sets of book cases and of books. The charges of conveying the cases of the Travelling Library was arranged to be met by the Education Committee. Three Urdu Travelling Libraries were got ready for circulation among the Mahomedan population.

PROGRESS IN THE DISTRICTS.

Chitaldrug.

AGRICULTURE.

Implements Sold.—One plough and twenty-eight plough shares were sold to ryots.

Supply of Seeds.—Fifty-one pallas of *Bile Jola* seeds, five pallas of *Navane* and 121 seers of wheat seeds were supplied to several districts for distribution. Twenty-four bags of *Doddahatti* seeds were got from the Hassan District and distributed to the royts in the Chitaldrug and Holalkere taluks.

Distribution of Oil-Cake.—One hundred maunds of ground-nut oil-cake were distributed in the Chitaldrug Taluk.

An Agricultural School.—Mr. A. B. Venkata Rao of Asagod in the Jagalur Taluk has promised to give two acres of land for starting an Agricultural School.

Gardening of Plants.—One hundred and sixty fruit plants were planted in gardens.

EDUCATION.

Funds for a Library—Rupees twenty-five was collected from the Heggere people for a Library in the Hosadrug Taluk.

Patronage to a Journal.—With a view to encourage the Editor of the *Vanivilasa Journal* it was resolved that thirty copies of it should be purchased by the District and the Taluk Progress Committees.

Shimoga.

AGRICULTURE.

Tea and Rubber Cultivation, etc.—The Distri[ct] Committee resolved to request the Secretary, Ag[ri]cultural Committee, to depute experts to investiga[te] into the possibilities of introducing Sericulture, Te[a] and Rubber cultivation in the District.

An Agricultural Depot.—An Agricultural Dep[ot] has been opened at Sagar.

Supply of Seeds.—Regarding the supply of see[d] at the next Agricultural season the Committee re[-]solved to request the Amildars to arrange for th[e] opening of seed depots in as many places in thei[r] taluks as possible, to be in a position to distribut[e] good seeds of paddi and ragi to the cultivators i[n] time.

EDUCATION.

Reduction of Time Limit.—The District Committee agreed with the sub-committee in thinking that the reduction of time limit of conversion of grant-in-aid schools into *pakka* Government schools from seven years to three years, as recommended by the District Inspector of Education, was absolutely necessary in the interest of early spread of primary education in rural areas and it was accordingly resolved that a recommendation be made in the matter.

Conversion of V. E. Schools into A. V. Schools.—It was resolved to send up recommendations to the Inspector-General of Education to convert the V. E. Schools at Santebennur, Shiralkoppa, Benkipur and Malige into *pakka* A. V. Schools, considering their flourishing condition.

INDUSTRIES AND COMMERCE.

Entertaining a Rattan Expert.—The Committee resolved to request the Superintendent, Chamarajendra Technical Institute, Mysore, to send a man who has special knowledge in cleaning, curing and polishing rattan, to work at Agumbi for a period of six months on a pay of Rs. 50 per mensem.

GENERAL.

Village Improvement Work.—Village Improvement Work estimated at Rs. 672-8-0 has been executed in the Shikarpur Taluk.

Village Common Fund.—Village Common Fund amounting to Rs. 721-4-1 has been collected in the Shikarpur Taluk.

QUERIES.

Hints to Correspondents.

Write on one side of the paper only. (2) Write each query on a separate sheet of paper. This will facilitate answering questions as in many cases they may have to be referred to experts. Put your name and address down on every such sheet. No attention will be paid to unsigned queries. (3) Drawings for illustrations should be on separate sheets of paper. They must be made in black ink only on white paper—not in pencil or colour—and twice the size they are intended to appear, especially reference letters and figures. (4) Put titles to queries, and, when answering queries, put the number as well as the titles of the queries to which the replies refer. (5) No charge is made for inserting letters, queries, or replies. (6) Letters or queries asking for addresses of manufacturers or correspondents, or where tools or other articles can be purchased, or replies giving such information, cannot be inserted except as advertisements. No question is answered through the post. (7) Letters sent by correspondents under cover to the Editor, are not forwarded and the names of correspondents are not given to inquirers. (8) As the space devoted to queries and replies is limited, they should be drawn up as briefly as possible. (9) To facilitate reference, correspondents, when referring to any letters previously inserted, should mention the number of the letter, as well as the page on which it appears. (10) All communications should be addressed to the Editor, *Mysore Economic Journal*, "Ringwood", Bangalore.

1. Will you or any of your readers kindly let me have schemes with detail and complete estimates regarding capital required, building, engines, machinery, establishment, working expenses, etc., for starting (1) Ginning Factory, and (2) Weaving Factory? The estimates must be for small factories which can be worked at a profit.

Banganapalle,
20-12-18. M. H. P. GHATALAH.

2. Can any of your readers inform me the extent to which Rubber is grown in the Mysore State? and also the quantity of Rubber seeds that will be available yearly? At present it is not fetching them anything, but I think a very valuable oil can be got out of it. which will have similar properties to Linseed oil. If any body interested in the matter should send me samples of Rubber seeds (not less than a maund), I shall undertake some experiments on their behalf at the Government Soap Factory, Bangalore.

Bangalore,
27-12-18. S. G. SASTRY.

BOOKS IN BRIEF.

Introduction to the Study of Economics.—*By V. G. Kale, M.A., Professor of History and Economics, Fergusson College, Poona. Second Edition. Aryabhushan Press. Price Rs. 5.*

That a second and revised edition of Professor Kale's book has been called for shows that it has been appreciated in the right quarters. Professor Kale has taught the subject in his classes for some years now and knows where the Indian Student requires help. The subject of Indian Economics is itself new, in a sense, to students and teachers alike, and therefore its handling should be such as to create as little trouble as possible to both these, from the point of view of exposition. Professor Kale has, in our opinion, been careful to steer clear of the Scylla of controversy on the one side and the Charybdis of the apologist on the other. The preliminary chapters are no exception though they tread on ground which is peculiarly liable to disputation. As to the text it is to be added that Professor Kale, while he keeps to the main outlines of what the student should learn under the head of Economics proper, has taken care to see that he does not lose himself in the abstraction of so-called principles but learns as much as may be possible of the peculiar problems with which India has to deal. His handling of these questions from the point of view of the text-writer leaves little to be desired. The book is one which might well be studied by people wishing to take an intelligent interest in current Economic problems affecting India. It is comprehensive, accurate and thoroughly up-to-date. We would commend it to the attention of the Madras and Mysore University Boards of Studies in Economics.

Labour and Capital After the War.—*By Various Writers. With an introduction by the Rt. Hon'ble J. H. Whitley, M. P. Edited by S. J. Chapman, C. B. E., Professor of Political Economy in the University of Manchester. John Murray, London. 7sh. net.*

We congratulate Professor Chapman on the design of this book. Though it is made up of papers written by different persons, there is a connected purpose running through them, which makes it quite a first rate book on what should be the relations of employers and employed in the future. The War has unsettled many things but not least the position of capital and labour. What is to be the attitude of labour towards capital in the future and *vice versa* is the question of to-day? The disorganization that

might follow any general break-up of accepted notions of relationship between the two might mean worse than anarchy as it has in other parts of Europe and a dispassionate discussion of the relative merits or demerits of the positions assumed or taken has much to commend it. Mr. Whitley who writes a brief but suggestive introduction to the book says that "the cause for which the war has been fought, and the tragic sacrifices it has involved, give a supreme importance to the human relationships of industry. Liberty will have been won, not by 'man-power,' but by 'spirit-power.' Liberty itself is only a foundation: to build on it a worthy and enduring fabric needs the same 'spirit-power.'" He adds: "with a new sense of human values, we may hope to link all the workers in industry in a frank partnership for the common good. The safety of the State calls for the fullest development in a united purpose of all gifts of brain and hand." The contributers to this book, though they differ in their view-points, approach their subject with a common aim. If their spirit can inspire and pervade all industrial thinkers and leaders, we may as Mr. Whitley says, look with confidence to a new and happier "Industrial Age." Among other papers of supreme interest are the following:—On social and moral interest by the Bishop of Birmingham, a most suggestive one: on strikes by Mr. J. R. Clynes, which is a strikingly straightforward one; on equal opportunities for the employed and the employer, in which co-partnership, the wages question, the responsibility of employers, government and commerce and other topics are dealt with by Lord Leverhulme in his usual frank manner; on women's position in Industry by Adelaide Mary Anderson, in which she sums up in a most judicious spirit the case for the woman-worker; on social reconstruction by Mr. R. H. Tawney, in which the writer brilliantly sets out the problem of reconstruction after the War; on Capital and Labour by Seebohm Rowntree which is in that well-known writer's gifted vein; on re-adjustment of wages by the Editor, in which some fruitful suggestions are offered by him to regulate wages, perhaps the most thorny of all subjects which has to do with both employer and employed. We would add that no better and authoritative book on the subject of what should be the relationship of Labour and Capital in the coming years can be recommended than this one now under review. As an appendix to it is printed the first report of the Committee of the Ministry of Reconstruction on the relations between employers and employed, which enhances its value no little.

The Country Banker.—*By the late George Rae. With an introduction and notes by F. E. Steele. New and Revised Edition. John Murray, London: 6sh. net.*

Books on British banks and the British banking system are not ordinarily of the type to which Mr. Rae's book *The Country Banker* fortunately belongs. It is written in a style easily understood by Bank clerks and apprentices and what is more it is full of wise observations and practical hints useful alike to the beginner and the old hand at the counting house. There is not a chapter in this book in which the wide experience that Mr. Rae brought to bear on his task as an author is not shown to advantage. We would much like to see books of this kind prescribed and read in our Commercial Schools. We would also like to see this book in the hands of every Bank clerk in this country.

The Development of the British Empire.—*By M. Prothero, M.A. Messrs. Macmillan & Co., London.*

This is a commendable little book tracing the origin and growth of the British Empire, illustrated by maps and pictures of famous Empire builders. It is succinctly written and is free from controversial details.

Gums and Resins.—*By E. J. Parry, B.Sc., F.I.C., F.C.S. Sir Issac Pitman & Sons, London. Price: 2sh. 6d. net.*

This is the latest addition to *Pitman's Common Commodities and Industries.* It is devoted to resins, gums and gum resins and is brief and pointed to a degree. It gives just enough chemical information to make it useful to those for whom it is intended. Books of this kind, we would add in passing, should be introduced into industrial classes and they ought to be made subjects of study. As a hand-book for reference, it is a marvel of cheapness for the accurate information it contains.

Germany's Annexationist Aims.—*By S. Grumbach. Translated, Abbreviated and Introduced by J. Ellis Barker. John Murray, London. 3sh. 6d. net.*

What were the real aims of Germany in waging the great War she did against the nations of the World? Were they the moderate aims adumbrated by Herr Von Bethmann-Hollweg and other German politicians? If Grumbach is to be believed,—and he is to be for he quotes documents for and against and most of them are for wholesale annexation,—then it would seem that these were speaking either for themselves personally or to a gullible world which took them at their word. Grumbach's volume is apparently a veritable mine of first-hand evidence of Germany's real War aims. Mr. Ellis Barker has done a real service in making it available to English readers in this book in a convenient form. Grumbach has some references to India and these show

the ambitions of wily Germany in regard to this country. Once India and South Africa are gone—so we are told—England's position as a great Empire would be destroyed. Though the distance from Berlin to Bombay is great, still—we are asked to believe—the difficulty of threatening England in this direction would be small compared with attacking England by invasion across the channel. Herr Franz Kohlen, the German publicist, who writes thus concludes in these words: "Besides, the capital laid out on railways from Berlin to Bombay would be more usefully spent than a similar amount devoted to general armaments. Herein lies the true and the only solution of freeing ourselves from the English yoke. We must cut the connection with the English Colonies, South Africa and India, and create frontier's which enable us, with the help of our own railways and our Allies, to come in touch with them so that we need no longer take to the sea route or have to proceed by way of foreign territory......... From this point of view the creation of a federation which reaches beyond the Balkans and Turkey up to the gates of India and of Cape Colony becomes significant. That is the necessary and logical solution ...." It is fortunate that Germany's ambitions have been curbed and put an end to for all time to come by the Allies. All the same, it is good we know through this valuable book, for which we should thank Mr. Barker—perhaps one of the few publicists in England who has given continuous attention to Germany and German aims in this War—and that in the most authoritative manner possible of the objects with which Germany opened and fought her unrighteous War against Civilization.

The Works Manager.—*By Sidney Webb, Professor of Public Administration in the University of London. Longmans, Green & Co., London and Bombay.*

It is difficult to estimate the importance of a book of this kind, to works managers and others having to deal with masses of people either in factories or in big private establishments. The conditions to which Mr. Webb refers may not in their entirety be applicable to India but that we are fast approaching a general upheaval of labour in which the fortunes of capitalists, either individually or in their corporate capacity of joint-stock companies or private firms, few who have watched the changing times in this country will deny. Labour is daily becoming restive. What is this due to? Is it due to an inordinate desire on the part of the workers for increase in wages? Is it due to the high prices? or is it due to want of understanding between capital and labour? These are questions that require close attention. Then, again, what are the conditions under which labour in India is working? Are those of a character requiring attention at the hands of capitalists? In a word what should be the attitude of labour towards capital and *vice versa?* On all these questions the interested reader in India will find some useful suggestions in Mr. Webb's book. It is about the best little book we can recommended to our readers in this region of practical economics. Those of us in India who do not understand the present Labour crisis in England, will find Mr. Webb's book an eye-opener. Much of the trouble apparently has been due to misunderstanding between the Ministry of Munitions and Labour, more expecially over the interpretation of the the terms of contracts entered into between both. That much unnecessary inconvenience and worry could have been avoided by a clearer understanding between both cannot be denied. The duty cast on capital—whoever may represent it—to make Labour distinctly understand the terms on which it is asked to work is great. This duty, however, is not always satisfactorily discharged and the result is disastrous. This is only one aspect of the matter, however; other aspects are dealt with by Mr. Webb in a luminous manner in this book. Among other chapters of practical interest are the following:—the function of management, reducing the cost of production, appointments and dismissals, the recognition of trade unionism, the standard rate-payment by results, the "manners" of management, discipline, fatigue and accidents, and "scientific management" and "welfare work". We would heartily recommend this book to all those interested in Factory labour in India.

Half Hours with a Modern Alchemist.—*By B. S. Nirody B.A. With illustrations. Messrs. Hoe & Co., Madras. Price 1-8-0.*

This is a brightly written little book dealing with horticulture. It takes the form of a dialogue and is written in a simple style, being intended for little folk. We read in the end of chapter of IV, Vasanta Rao, one of the two who carry on the dialogue, saying, "At the end of about two years, I came to see that horticulture on modern lines, was hardly different from alchemy." His conclusion is that every one should independently of his regular calling, should have a pursuit "of some practical value to the economic progress of the country and without detriment to the employer's interest. A conclusion with which most sensible people will readily agree. And what more agreeable pursuit can one have than horticulture? The chapters that make up this little book were originally written for the *Arthasadhaka Patrike*, the Kannada edition of this *Journal*, and they were at the time of their appearence largely read and greatly appreciated. The book should prove a welcome addition to the School Library. We commend it to the attention the State Education Department.

President Wilson.—*Speeches on World's Freedom. With foreword by Dr. S. Subramanya Iyer. Also a life sketch by K. Vyasa Rao. Ganesh & Co., Madras. Price one Rupee.*

Dr. Subramanya Iyer in his foreword to this handy edition of Dr. Wilson's recent utterances on world freedom says that "one cannot resist stating that these speeches, so authoritative and clear, reach the high water mark of public political morality as not only to constitute them the highest example of the kind known to history but also as presaging the advent of a new era of political liberty to the coloured and the white races alike." This fact alone, as he rightly remarks, ought to justify the widest reception in India to this volume containing as it does pronouncements made for the very practical purpose of a whole nation ensuring by its sacrifices freedom to Humanity as a whole. More words are not, we think, needed to commend this book to the reading public of India. Mr. Vyasa Rao's sketch of the life and career of Dr. Wilson enhances the value of the book not a little, because it is not a mere chronicle of the leading events of his life but a character study, short though it be, in itself.

Perfumery and Essential oil Record.—Year Book and Diary for 1919.—*W. J. Bush & Co., Ltd., Ashgrove Hackney, London, E. 8.* We congratulate Mr. John C. Umney, F. C. S. on the excellent Year Book and Diary he has produced. Though some of the familiar features have disappeared, the present issue is by no means less interesting. The review of the work on Essential oils, perfumery and allied products by the Editor, is a most valuable one. It ought to prove of special interest to those engaged in the manufacture of these products in this country. There are the usual tables which we associate with the Year Book. One of these is devoted, as in the previous editions, to constituents of essential oils and artificial products. The Diary portion (2 weeks a page) also deserves praise. The get up of the book leaves little to be desired. We shall be glad to hear of the growing popularity of the *Perfumery and Essential Oil Record* in Mysore, in which the production of perfumes and scents is an old and established industry.

ACKNOWLEDGMENTS.

Accounts relating to the Sea-borne Trade and Navigation of British India, December 1918. *Superintendent, Government Printing, India, 1919. Price 6as. or 9d.*

RECENT PUBLICATIONS.

Economic Statemanship. *The great industrial and financial problems arising from the war. By J. Ellis Barker. 8½×5½, ix. + 408 pp. Murray. 15s. n.*

The British Aircraft Industry. *Its Industrial and commercial potentialities. 7½×5, xi. + 305 pp. Hodder and Stoughton. 6s. n.*

Money: *Its connexion with rising and falling prices. By Edwin Cannan, Professor of Political Economy in the University of London. 7¼×4¾, 66 pp. P. S. King. 2s. 6d. n.*

State Credit and Banking. *During the war and after. A suggestion for a central institution to provide means for after-war development, by enabling holders of Government securities to borrow thereon. By Robert Benson. 10×8, 53 pp. Macmillan. 5s. n.*

Liberal Policy: *in the task of Political and Social Reconstruction. 8½+5½, 129 pp. Liberal Publication Department. 2s. 6d. n.*

A Challenge to Economists. *By J. S. Hecht. 6½×4¼, 44 pp. P. S. King. 2s. n.*

Petrol and Petroleum Spirits. *A description of their sources, preparation, examination, and uses. By Wilfred E. Guttentag. With a preface by Professor Sir John Cadman, K.C.M.G. 8¾×5½, xi+135 pp. Arnold. 10s. 6d. n.*

Outlines of Social Philosophy. *By J. S. Mackenzie. 8¾×5¾, 280 pp. Allen and Unwin. 10s. 6d. n.*

Labour and Industry in Australia. *From the first settlement in 1788 to the establishment of the Commonwealth in 1901. By T. A. Coghlan. Four Volumes. Vol. I, viii.+587 pp. Vol. II, vi+589-1, 185 pp. Vol. III, V+1, 187-1789 pp. Vol. IV. V+1791-2449 pp. Milford. 73s. 6d. n.*

Pedagomania, *or the Gentle Art of Teaching. By "A Bachelor of Arts." 7½×5, viii+135 pp. Fisher Unwin. 4s. 6d. n.*